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THOMSON

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# KEY

TO THOMSON'S NEW

# PRACTICAL ARITHMETIC;

FOR THE USE OF TEACHERS.

By JAMES B. THOMSON, LL.D.,
AUTHOR OF THOMSON'S NEW GRADED SERIES, ETC.

NEW YORK:
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1884.

# NOTE.

Why should teachers want a Key, it is asked. It looks suspicious, says one. If they cannot solve the examples, they are not qualified for their station, adds another.

The character and scholarship of those who suggested the present work, are above suspicion. They desire it, not because they cannot solve the examples, but to *expedite the detection of errors;* they wish it, not because they shrink from toil, but to *save time*, which they wish to devote to illustrations and exercises upon the blackboard.

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The plan of the work is to indicate the operations and give the results, omitting the minor details. It is hoped teachers will find it adapted to their wants.

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# KEY.

## NOTATION.

*Page 15.*

1. 345.
2. 460.
3. 804.
4. 2310.
5. 30019.
6. 63200.
7. 110212.
8. 460930.
9. 605842.
10. 2060075.

## ROMAN NOTATION.

*Page 17.*

1. XIV.
2. XXIX.
3. XXXIV.
4. LXVI.
5. XLIX.
6. LXXIII.
7. LXXXVIII.
8. XCIV.
9. XCIX.
10. CVII.
11. CCXII.
12. CCCCXCVIII.
13. DCXIII.
14. DVII.
15. DCVIII.
16. DCCXXIV.
17. DCCCXXIX.
18. DCCCCXXVIII.
19. MIV.
20. MCCIX.
21. MCCCLXIII.
22. MCCCCXVII.
23. MDCXIV.
24. MDCLXXI.
25. MDCCXLVIII.
26. MDCCCIII.
27. MDCCCLXXVI.

# FRENCH NUMERATION.

*Page 19.*

1. 10,005,200.
2. 61,000,340.
3. 310,000,500.
4. 26,070,000,300.
5. 100,000,000,425.
6. 68,000,000,000,725.
7. 820,000,523.

*Page 20.*

8. 67,000,097,000,000,000.
9. 460,000,000,087,000,000.
10. 761,071,200,018,005,036.

# ADDITION.

*Page 23.*

2. 7,799.
3. 8,857.
4. 8,553.
5. 7,959.
6. 97,645.
7. $5,689.

*Page 24.*

8. 9,834 lbs.
9. 733,677.
10. 3,765,098.

*Page 25.*

2. 13,839.
3. 18,250.
4. 20,000.
5. 20,438.
6. 212,269.

## EXAMPLES

*Page 26.*

1. 2,806.
2. $1,941.
3. 25,285 lbs.
4. 14,756 yds.
5. 98,937 rods.
6. 2,051,834 ft.
7. 2,460 acres.
8. 23,459.
9. 185,462.
10. 76,876.
11. 33,367.
12. 179,589.
13. 273,070.
14. 2,616,263.
15. 9,539,381.
16. $4,668.

*Page 27.*

17. 1,376 yds.
18. $6,332.
19. 1,695 lbs.
20. 2,668 gals.
21. 10,438.
22. 8,636.
23. 10,672.
24. 2,874.
25. 15,246.

26. 100,980.
27. 1,207,053.
28. $9,193.
29. 3,998 bu.
30. $107,601.
31. $38,058.
32.
1363
87
1094
300
*Ans.* 2,844
33.
3240
1560
9000
*Ans.* 13,800

*Page 28.*

34.
90302
65030
4423
*Ans.* 159,755
35.
800800
40040
7007
909
*Ans.* 848,756
36. 182,404.
37. 1,039,708.
38. 11,485.
39. 9,929.
40. 13,720.
41. 233,331.
42. 1,328,464.
43. 8,237,027.
44. 25,148.
45. 11,111,110.
46. 22,226,420.
47.
$365
365
365
365
$1,460 *Ans.*
48.
1850
75
A.D. 1,925 *Ans.*
49.
1365
1365
1365
1365
1365
1365
$8,190 *Ans.*
50. 6,987 lbs.
51. 29+47+17=93 y.
52.
$21213
375
375
375
$22,338 *Ans.*

*Page 29.*

53. A's=$4369 = 4369
B's= 3978 = 3978
plus 135
C's = 8482
D's=A+B+C's=16829
Whole tax =$33,658

54. 1+2+3+4+5+6+7+8+9+10+11+12= 78 strokes in 12 hours. 78+78=156 s. in 24 h.

55. A's =3,245 bu.
B's=3245
+ 723 =3,968 "
*Ans.* Both =7,213 bu.

56. 31 added to itself 7 times =217 d.
30 added to itself 4 times =120 d.
1 mo. = 29 d.
*Ans.* 366 d.

57. $2648+$2648=$5,296.

58. 31273+19256=50,529.

59. A has 860 a.
B " 860+117= 977 "
C=A+B=
860+977=1837 "
*Ans.* 3,674 a.

60. $437.44.

61. $571.54.

62. $376.02.

63. $476.19.

64. $501.31.

65. $475.89.

### *Page 30.*

66. $1704.28. *Ans.*
18, 14, 11,

NOTE.—The small figures 18, 14, 11, etc., placed under this and the following answers, are the numbers carried from one column to the next. (Art. 31, N. 2.)

67. $16988.71. *Ans.*
14, 15, 14, 13.

68. $16580.34. *Ans.*
20, 18, 15, 12.

69. $179403.71. *Ans.*
17, 14, 19, 16, 14, 17.

70. $157011.73. *Ans.*
15, 18, 19, 14, 15.

## SUBTRACTION.

### *Page 33.*

1. Given.
2. 233.
3. 210.
4. 5,212.
5. 3,110.
6. 1,111.
7. 4,202.
8. 3,332.
9. 2,632.
10. 4,332.
11. 1,111.
12. $4,532.
13. 1,103 ft.
14. $2,240.
15. 4,636 yds.
16. 210,911.
17. 2,121,020.
18. 30,464,602.
19. 361,103,402.

20. 1,143.
21. 2,120.
22. 1,500.

*Page 35.*

1. Given.
2. 346.
3. 147.
4. 3,106.
5. 2,603.
6. 509.

## EXAMPLES.

*Page 36.*

1. 53,637.
2. 305 rods.
3. 67 pounds.
4. 3,779 years.
5. 1,719 acres.
6. 11,574.
7. 22,359.
8. 27,179.
9. 267,642.
10. 235,009.
11. 5,009,009.
12. 5,542,809.
13. 2,738,729.
14. 51,989 pounds.
15. 309,617 tons.
16. 209,354 acres.
17. 34,943.
18. 1,235,993.
19. 3,633,805.
20. 33,230,076.
21. 349,629,696.
22. $18,990.
23. $1,915.
24. $415,026.
25. $200,005.

*Page 37.*

26. $279,979.
27. 1,111,111.
28. 6,333,333,334.
29. 1,111,111,112.
30. 289,753,017,746.
31. 27,030,584,428,516.
32. 226,637,999,876,130.
33. 1,990,005.
34. 995,500.
35. 64,564.
36. 999,001,000.
37. From the present year subtract 1776.
38. From the present year subtract 1620.
39. 2,235 acres.
40. 26,530,000 miles.
41. A.D. 1732. *Ans.*
42. 84 years.
43. A.D. 1642. *Ans.*
44. 413,000,000 miles.
45. $3,115,027.
46. 8,253,204.

## QUESTIONS FOR REVIEW.

*Page 38.*

1. Income, $1565
   " 1565 = $3130
   Outgoes, $965
   " 965 = 1930
   Net profit, = $1200

2. Selling price = $4500
   Farm, $2635
   Stock, 758 = 3393
   Gain, = $1107

3. Stock, = 3560 bar.
   Sold, 1380
   " 985 = 2365 "
   *Ans.* 1195 bar.

4. Deposit, = $6530
   Check, $733
   " $733
   " $733 = $2199
   *Ans.* $4331

5. 3658
   256
   4236 = 8150
   2430
   1249 = 3679
   Dif. = 4471

6. 6035
   560
   75 = 6670
   5003
   360
   28 = 5391
   Dif. = 1279

7. 891
   306
   5007 = 6204
   40
   601
   1703
   89 = 2433
   Dif. = 3771

8. 900130
   23040 = 923,170
   19004
   100607 = 119,611
   Dif. = 803,559

9. Capital, = $16250
   Gain, = 3245
   $19495
   Expenses, = 5203
   Balance, = $14,292

10. $275
    320
    418 = $1013 cost.
    Paid, 50 down.
    Bal. owed, = $963 *Ans.*

11. $3263 Rec'd.
    5490 "
    7205 = $15,958
    Lost, $4795
    Minus 1360 = 3435
    Worth, $12,523

12. 6286
plus 850=7136
6286
minus 850=5436
Dif. 1700 *Ans.*

13. 11325
minus 2361=8964
8030
minus 3500=4530
Dif. =4434

14. 215378
103256
112,122 *Ans.*

15. 700700
573020
127,680 *Ans.*

*Page 39.*

16. 230375
121487
108,888 *Ans.*

17. 317250
190300
126,950 *Ans.*

18. Greater, 59253
Dif., 21231
Less, 38,022 *Ans.*

19. Greater, 45261
Dif., 1363
Less, 43,898 *Ans.*

20. Sum, 63270
One, 29385
Other, 33,885 *Ans.*

21. 3265
minus 291=2974
2343
minus 131=2212
*Ans.* 76

22. 6539
minus 279= 6260
3520
plus 1060= 4580
*Ans.* 1,680

23. Given number =5009
2340+471 =2811
*Ans.* 2,198

24. Carp'r, $5260
Masonry, 3520
Painting, 1950=$10730
Payment, 6000
Bal. owed, $4,730

25.

| EARNED. | EXPENDED. |
|---|---|
| $150 | $63 |
| 150 | 63 |
| 150 | 63 |
| 150 | 63 |
| 150 | 63 |
| 150 | 63 |

$900 — $378 = $522

26. $1165 = $1165 A's
minus 163 = 1002 B's
A's + B's = 2167
minus 365
*Ans.* $1802 C's

27. A's property $15230
minus 1260
B's " $13970
plus 15230
$29200
minus 1760
C's " $27440

28. 21000 = 21000 1st.
minus 8200 = 12800 2d.
2d, 12800
minus 7013 = 5787 3d.
First three = 39587
Whole sum, 45260
First three, 39587
*Ans.* 5673 4th.

29. $1000
minus 263
*Ans.* $737

30. B's estate = $17250
Dif. = 1525
A's estate = $18775

# MULTIPLICATION.

### *Page 44.*

2. 10,252.
3. 66,390.
4. 15,889,218.
5. 336,232,855.
6. $6,000.
7. $12,375.
8. $35,000.
9. $9,515.
10. 4,296 miles.
11. 432,520.
12. 5,621,889.
13. 2,641,260.
14. 7,360,256.
15. 5,427,450.
16. 8,103,050.
17. 8,292,075.
18. 11,455,620.
19. $29,652.
20. 56,837 cts.
21. 9,570 shil.
22. $16,200.
23. $15,615.
24. 28,356 shil.
25. 26,080 miles.
26. $45,600.
27. $134,750.
28. $279,000.

### *Page 46.*

1. Given.
2. 10,224. *Ans.*
3. 19,705. *Ans.*
4. 64,896. *Ans.*
5. 761,824. *Ans.*

## EXAMPLES FOR PRACTICE.

*Page 47.*

1. Given.
2. 242,735. *Ans.*
3. 1,230,710. *Ans.*
4. 3,627,525. *Ans.*
5. 20,136,672. *Ans.*

*Page 48.*

6.
1421673
234
5686692
4265019
2843346
332,671,482. *Ans.*

7.
2342678
402
4685356
9370712
941,756,556 *Ans.*

8.
4392460
347
30747220
17569840
13177380
1,524,183,620 *Ans.*

9.
5230648
526
31383888
10461296
26153240
2,751,320,848 *Ans.*

10.
640231
205
3201155
1280462
131,247,355 *Ans.*

11.
520608
675
2603040
3644256
3123648
351,410,400 *Ans.*

12.
431220
1234
1724880
1293660
862440
431220
532,125,480 *Ans.*

13.
623075
2650
31153750
3738450
1246150
1,651,148,750 *Ans.*

14.
730650
2167
5114550
4383900
730650
1461300
1,583,318,550 *Ans.*

***Page 48—Continued.***

15.
593287
6007
3,563,875,009 *Ans.*

16.
843700
3465
4218500
5062200
3374800
2531100
2,923,420,500 *Ans.*

17.
748643
2100
74864300
1497286
1,572,150,300 *Ans.*

18.
9000401
50001
9000401
45002005
450,029,050,401 *Ans.*

19.
82030405
23456
492182430
410152025
328121620
246091215
164060810
1,924,105,179,680 *Ans.*

NOTE.—The *true* multiplicand, in this and all practical examples, is that number which, added to itself a given number of times, will produce the *required product*. The reasoning in the analysis should always be based upon this fact. (Art. 40.)

But in the operation, it is customary to take the *smaller* number for the multiplier. In such cases great care should be taken to apply to the *product* the *name* of the *true* multiplicand. (Arts. 45, N., 46.)

20.
1375
63
4125
8250
*Ans.* 86625 pounds.

21. $55350. *Ans.*

22. 22360 bu.

23.
1368
163
4104
8208
1368
222984 *Ans.*

24.
365
215
1825
365
730
*Ans.* 78475 miles.

25. 5280 ft.
256
31680
26400
10560
*Ans.* 1351680 ft.

26. 2115
23
6345
4230
$48645 *Ans.*

27. 1978
17
13846
1978
$33626 *Ans.*

28. $4735
500
$2367500 *Ans.*

29. 2163
25
10815
4326
*Ans.* 54075 yds.

30. 15265
117
106855
15265
15265
$1786005 *Ans.*

31. 3563
68
28504
21378
$242284 *Ans.*

32. 6 d. × 8 h. = 48 h.
48 × 9 m. = 432 m. *Ans.*

## CONTRACTIONS.

*Case I. Page 50.*

Ex. 1, 2. Given.

3. 2604
5
13020
5
65100 *Ans.*

4. 6052
6
36312
8
290496 *Ans.*

5. 8091
7
56637
9
509733 *Ans.*

6. 45321
9
407889
8
3263112 *Ans.*

7. 1728 Cu. in.
7
12096
12
*Ans.* 145152 Cu. in.

8. $5268
7
36876
8
$295008 *Ans.*

9. $1580
5
7900
5
39500
5
$197500 *Ans.*

***Case II. Page 50.***

10. Given.
11. $356,000. *Ans.*
12. 40,530,000. *Ans.*
13. 98,506,850,000. *Ans.*
14. 8,405,007,100,000.
15. 360,753,429,000,000.

***Case III. Page 51.***

20. Given.
21. 1,491,000. *Ans.*
22. 3,328,000. *Ans.*
23. 166,092,000. *Ans.*
24. 740,000 pounds.
25. $184,000. *Ans.*
26. 2,600,000 cts. *Ans.*
27. $525,000. *Ans.*
28. 604,800,000 times.
29. $7,350,000.

30. 670103700
60030040
26804148
20103111
40206222
40,226,351,915,148,000

31. 800021000
80002100
800021
1600042
6400168
64,003,360,044,100,000

32. 570305000
40000620
1140610
3421830
2281220
22,812,553,589,100,000

***Page 52.***

33. 467234630
27000000
32706424 1
93446926
12,615,335,010,000,000

34. 3507412 37
890000000
3156671133
2805929896
312,159,700,930,000,000

35. 9400000027
28000000
75200000216
18800000054
263,200,000,756,000,000

36. 39200000
530000
1176
1960
20,776,000,000,000

37. 700100
102
14002
7001
71410200 1st p.
601020
1428204
714102
4284612
42,918,958,404,000 2d p.

38. 74021000
5005000
370105
370105
370,475,105,000,000

39. 31031031
21021
31031031
62062062
31031031
62062062
652,303,302,651

40. 2002002200
200200
40040044
40040044
400,800,840,440,000

*Case IV. Page 52.*

42. 1368 × 13
4104
17784 *Ans.*

43. 2106 × 14
8424
29484 *Ans.*

44. 3065 × 15
15325
45975 *Ans.*

45. 6742 × 16
40452
107872 *Ans.*

46. 25269 × 18
202152
454842 *Ans.*

47. 83467 × 19
751203
1585873 *Ans.*

# SHORT DIVISION.

***Page 57.***

1. Given.

2. 2)4468
*Ans.* 2234

3. 3)3696
*Ans.* 1232

4. 4)4848
*Ans.* 1212

5. 5)5555
*Ans.* 1111

***Page 59.***

1. Given.

2. 2)436784
*Ans.* 218392

3. 3)560346
*Ans.* 186782

4. 4)689034
*Ans.* 172258½

5. 5)748239
*Ans.* 149647⅘

6. 6)3972647
*Ans.* 662107⅙

7. 7)4806108
*Ans.* 686586⅐

8. 8)7390464
*Ans.* 923808

9. 9)8306729
*Ans.* 922969⅞

10. 10)57623140
*Ans.* 5762314

11. 11)667301451
*Ans.* 60663768$\frac{3}{11}$

12. 12)8160252397
*Ans.* 680021033$\frac{1}{12}$

13. $2)$16486
*Ans.* 8243 hats.

14. $4)$844
*Ans.* 211 sheep.

15. 3r.)26936 r.
*Ans.* 8978⅔ times.

16. 4)$42684
*Ans.* $10671 apiece.

17. 3)366 yds.
*Ans.* 122 yds.

18. 6)84844 pounds.
*Ans.* 14140⅔ pounds.

19. 8)$64968
*Ans.* $8121 each.

***Page 60.***

20. 4)4268410
*Ans.* 1067102½

21. 6)5601234
*Ans.* 933539

*Page 60—Continued.*

22. 5)6403021
*Ans.* 1280604$\frac{1}{5}$

23. 7)7008134
*Ans.* 1001162

24. 11)8210042
*Ans.* 746367$\frac{5}{11}$

25. 8)9603048
*Ans.* 1200381

26. 10)23468420
*Ans.* 2346842

27. 9)32064258
*Ans.* 3562695$\frac{3}{9}$

28. 8)46785142
*Ans.* 5848142$\frac{6}{8}$

29. 7)59130628
*Ans.* 8447232$\frac{4}{7}$

30. 11)653000638
*Ans.* 59363694$\frac{4}{11}$

31. 12)774230029
*Ans.* 64519169$\frac{1}{12}$

32. 7)26563 days.
*Ans.* 3794$\frac{5}{7}$ weeks.

33. 6)$38472
*Ans.* $6412

34. $7)$63456
*Ans.* 9065$\frac{1}{7}$ tons.

35. $9)$47239
*Ans.* 5248$\frac{7}{9}$ bar.

36. 12)41260 months.
*Ans.* 3438$\frac{4}{12}$ years.

37. $7)$45285
*Ans.* 6469$\frac{2}{7}$ yards.

38. 8)75240 shillings.
*Ans.* 9405 dollars.

39. 9)52308 sq. feet.
*Ans.* 5812 sq. yards.

40. 10)25000 miles.
*Ans.* 2500 hours.

41. 12)845280 eggs.
*Ans.* 70440 baskets.

42. 8)$116248
*Ans.* $14531

43. 7)2346281 acres.
*Ans.* 335183 acres.

44. $8)$111364
*Ans.* 13920$\frac{4}{8}$ bbls.

45. 11)$88990
*Ans.* 8090 cows.

# LONG DIVISION.

***Page 63.***

1, 2. Given.

3. 15)34685

*Ans.* $2312\frac{5}{15}$

1st prod. 30, 2d div. 46.
2d " 45, 3d " 18.
3d " 15, 4th " 35.
4th " 30, Rem. 5.

4. 16)65456

*Ans.* 4091

1st prod. 64, 2d div. 145.
2d " 144, 3d div. 16.
3d " 16, Rem. 0.

5. 20)41534

*Ans.* $2076\frac{14}{20}$

1st prod. 40, 2d div. 153.
2d " 140, 3d " 134.
3d " 120, Rem. 14.

6. 25)52663

*Ans.* $2106\frac{13}{25}$

1st prod. 50, 2d div. 26.
2d " 25, 3d " 163.
3d " 150, Rem. 13.

7. 39)420345

*Ans.* $10778\frac{3}{39}$

1st prod. 39, 2d div. 303.
2d " 273, 3d " 304.
3d " 273, 4th " 315.
4th " 312, Rem. 3.

8. 47)506394

*Ans.* $10774\frac{16}{47}$

1st prod. 47, 2d div. 363.
2d " 329, 3d " 349.
3d " 329, 4th " 204.
4th " 188, Rem. 16.

9. 69)673406

*Ans.* $9759\frac{35}{69}$

1st prod. 621, 2d div. 524.
2d " 483, 3d " 410.
3d " 345, 4th " 656.
4th " 621, Rem. 35.

10. 77)789408

*Ans.* $10252\frac{4}{77}$

1st prod. 77, 2d div. 194.
2d " 154, 3d " 400.
3d " 385, 4th " 158.
4th " 154, Rem. 4.

11. 86)4375023

*Ans.* $50872\frac{31}{86}$

1st prod. 430, 2d div. 750.
2d " 688, 3d " 622.
3d " 602, 4th " 203.
4th " 172, Rem. 31.

12. 93)5700429

*Ans.* $61294\frac{87}{93}$

1st prod. 558, 2d div. 120.
2d " 93, 3d " 274.
3d " 186, 4th " 882.
4th " 837, 5th " 459.
5th " 372, Rem. 87.

13. 59)6004531
*Ans.* 101771$\frac{42}{59}$

1st prod. 59, 2d div. 104.
2d " 59, 3d " 455.
3d " 413, 4th " 423.
4th " 413, 5th " 101.
5th " 59, Rem. 42.

14. 78)8430905
*Ans.* 10808841$\frac{17}{78}$

1st prod. 78, 2d div. 630.
2d " 624, 3d " 690.
3d " 624, 4th " 665.
4th " 624, Rem 41.

15. 89)7895432
*Ans.* 88712$\frac{64}{89}$

1st prod. 712, 2d div. 775.
2d " 712, 3d " 634.
3d " 623, 4th " 113.
4th " 89, 5th " 242.
5th " 178, Rem. 64.

16. 98)9307108
*Ans.* 94970$\frac{48}{98}$

1st prod. 882, 2d div. 487.
2d " 392, 3d " 951.
3d " 882, 4th " 690.
4th " 686, Rem. 48.

17. $75)$18246
*Ans.* 243$\frac{21}{75}$ acres.

1st prod. 150, 2d div. 324.
2d " 300, 3d " 246.
3d " 225, Rem. 21.

18. $83)$37682
*Ans.* 454 ambulances.

1st prod. 332, 2d div. 448.
2d " 415, 3d " 332.
3d " 332, Rem. 0.

***Page 64.***

19. Given.

20. 127)3784123
*Ans.* 29796$\frac{31}{127}$

1st p. 254, 2d div. 1244.
2d " 1143, 3d " 1011.
3d " 889, 4th " 1222.
4th " 1143, 5th " 793.
5th " 762, Rem. 31.

21. 219)43611729
*Ans.* 199161$\frac{125}{219}$

1st p. 219, 2d div. 2171.
2d " 1971, 3d " 2007.
3d " 1971, 4th " 362.
4th " 219, 5th " 1439.
5th " 1314, Rem. 125.

22. 378)8953046
*Ans.* 23685$\frac{116}{378}$

1st p. 756, 2d div. 1393.
2d " 1134, 3d " 2590.
3d " 2268, 4th " 3224.
4th " 3024, 5th " 2006.
5th " 1890, Rem. 116.

*Page 64—Continued.*

23. 738)9073219
*Ans.* 12294$\frac{247}{738}$

3d " 1476, 4th " 6961.
4th " 6642, 5th " 3199.
5th " 2952, Rem. 247.

24. $95)$42750
*Ans.* 450 shawls.

1st p. 380, 2d div. 475.
2d " 475, Rem. 0.

25. 144)59264
*Ans.* 411$\frac{80}{144}$ sq. ft.

1st p. 576, 2d div. 166.
2d " 144, 3d " 224.
3d " 144, Rem. 80.

26. 312)29328
*Ans.* $94

27. 128)69240
*Ans.* 540$\frac{120}{128}$ cords.

1st p. 640, 2d div. 524.
2d " 512, Rem. 120.

28. 250)150648
*Ans.* $602$\frac{148}{250}$

1st p. 1500, 2d div. 648.
2d " 500, Rem. 148.

29. 1728)250342
*Ans.* 144$\frac{1510}{1728}$ c. ft.

1st p. 1728, 2d div. 7754.
2d " 6912, 3d " 8422.
3d " 6912, Rem. 1510.

30. 11200)560245(50$\frac{245}{11200}$ pounds.
56000
Rem. 245

31. 4204)36942536
*Ans.* 8787$\frac{1288}{4204}$

1st prod. 33632, 2d div. 33105.
2d " 29428, 3d " 36773.
3d " 33632, 4th " 31416.
4th " 29428, Rem. 1988.

32. 5129)57300652
*Ans.* 11171$\frac{4593}{5129}$

1st prod. 5129, 2d div. 6010.
2d " 5129, 3d " 8816.
3d " 5129, 4th " 36875.
4th " 35903, 5th " 9722.
5th " 5129, Rem. 4593.

*Page 64—Continued.*

33. 52312)629348206

*Ans.* $12030\frac{34846}{52312}$

34. 61073)730500429

*Ans.* $11961\frac{6276}{61073}$

1st prod. 61073, 2d div. 119770.
2d " 61073, 3d " 586974.
3d " 549657, 4th " 373172.
4th " 366438, 5th " 67349.
5th " 61073, Rem. 6276.

35. 236421)7300400029

*Ans.* $30878\frac{192391}{236421}$

1st prod. 709263, 2d div. 2077700.
2d " 1891368, 3d " 1863322.
3d " 1684947, 4th " 2083759.
4th " 1891368, Rem. 192391.

36. 463205)8230124037

*Ans.* $17767\frac{360802}{463205}$

1st prod. 463205, 2d div. 3598074.
2d " 3242435, 3d " 3556390.
3d " 3242435, 4th " 3139553.
4th " 2779230, 5th " 3603237.
5th " 3242435, Rem. 360802.

37. 203963428)843000329058

*Ans.* $4133\frac{19481134}{203963428}$

1st prod. 815853712, 2d div. 271466170.
2d " 203963428, 3d " 675027425.
3d " 611890284, 4th " 631371418.
4th " 611890284, Rem. 19481134.

*Page 65.*

38. 1250)$5000000($4000 *Ans.*
5000
Rem. 000

39. 478)$18120000
*Ans.* $37907$\frac{454}{478}$

1st prod. 1434, 2d div. 3780.
2d " 3346, 3d " 4340.
3d " 4302, 4th " 3800.
4th " 3346, Rem. 454.

40. 942)272090
*Ans.* 288$\frac{794}{942}$ acres.

1st prod. 1884, 2d div. 8369.
2d " 7536, 3d " 8330.
3d " 7536, Rem. 794.

41. 5263)$42368200
*Ans.* $8050$\frac{1050}{5263}$

1st prod. 42104, 2d div. 26420.
2d " 26315, Rem. 1050.

42. 36000)$9900000
*Ans.* $275

1st prod. 72000, 2d div. 270000.
2d " 252000, 3d " 180000.
3d " 180000, Rem. 0.

43. 525600)105192000
*Ans.* 200$\frac{72000}{525600}$ years.

1st prod. 1051200, Rem. 72000.

## CONTRACTIONS.

***Case I. Page 66.***

1. Given.

2. $21 = 3 \times 7$.

7)357

3)51

17 *Ans.*

3. $28 = 7 \times 4$.

7)532

4)76

*Ans.* $19\frac{1}{28}$, or 19 oranges.

4. $35 = 5 \times 7$.

*Ans.* 23 pounds.

5. $63 = 9 \times 7$.

*Ans.* 12 companies.

6. $12 = 2 \times 6$, or $3 \times 4$.

*Ans.* 17.

7. $16 = 2 \times 8$, or $4 \times 4$.

*Ans.* 23.

8. $30 = 5 \times 6$, or $2 \times 3 \times 5$.

*Ans.* 26.

9. Given.

***Page 67.***

10. 9)43271

5)4807—8, 8, 1st rem.

961—2; $2 \times 9 = 18$, 2d "

True rem. 26

$961\frac{26}{45}$. *Ans.*

11. 9)502378

7)55819—7, 7, 1st rem.

7974—1; $1 \times 9 = 9$, 2d "

True rem. 16

$7974\frac{16}{63}$. *Ans.*

12. 9)710302

8)78922—4, 4, 1st rem.

9865—2; $2 \times 9 = 18$, 2d "

True rem. 22

$9865\frac{22}{72}$. *Ans.*

13. 7)3005263

3)429323—2 2, 1st rem.

4)143107—$2 \times 7 =$ 14, 2d "

35776—$3 \times 3 \times 7 = 63$, 3d "

True rem. = 79

$35776\frac{79}{84}$. *Ans.*

14. 8)63400511
6)7925063—7, = 7, 1st rem.
2)1320843—5; 5×8 =40, 2d "
660421—1; 1×6×8=48, 3d "
True rem. 95
$660421\frac{95}{96}$. *Ans.*

15. 6)216300265
6)36050044—1, 1, 1st rem.
4)6008340—4; 4×6=24, 2d "
1502085 True rem. 25
$1502085\frac{25}{144}$. *Ans.*

***Case II. Page 68.***

16. Given.
17. $752\frac{36}{100}$. *Ans.*
18. $245\frac{65}{1000}$. *Ans.*
19. $80\frac{5211}{10000}$. *Ans.*
20. $98\frac{20341}{100000}$. *Ans.*
21. $9\frac{526401}{1000000}$. *Ans.*
22. $8\frac{43264}{10000000}$. *Ans.*

***Case III. Page 69.***

23. Given.
24. $2283\frac{18}{20}$. *Ans.*
25. $406\frac{186}{200}$. *Ans.*
26. $177\frac{1445}{3400}$. *Ans.*
27. $113\frac{5821}{6500}$. *Ans.*
28. 87|000)7341|264
84, 33 rem.
*Ans.* $84\frac{33264}{87000}$.
29. 93|000)8004|367
86, 6 rem.
*Ans.* $86\frac{63367}{93000}$.
30. 125|000)61273|203
490, 23 rem.
*Ans.* $490\frac{23203}{125000}$.
31. 67|0000)41604|3271
620, 64 rem.
*Ans.* $620\frac{643271}{670000}$.
32. 37300 cts.=$373. (Art. 79.)
33. 229 horses.
34. $\$75\frac{360}{1000}$.
35. $\$48|00)\$252|00$
5, 12 rem.
*Ans.* $5\frac{1200}{4800}$ lots.
36. 60 bales.

## QUESTIONS FOR REVIEW.

*Page 69.*

1. 219 − 73 = 146, J's m.
   219 + 146 = 365, both.
2. 775 − 368 = 407 sheep.
3. 57 + 19 = 76 years.
4. 3147 − 1368 = 1779. *Ans.*
5. 4118 − 1025 = 3093. *Ans.*
6. 7905 ÷ 95 = 83 $\frac{20}{95}$. *Ans.*
7. 2967 ÷ 69 = 43 rods.
8. 5263 − 145 = 5118 bu.
9. 99 × 87 = 8613. *Ans.*
10. 7595 ÷ 217 = 35. *Ans.*
11. Quotient = 589
    Divisor = 341
    589
    2356
    1767
    Div. 200849 *Ans.*

*Page 70.*

12. Received, $5275
    Cost 516 × 9 = 4644
    *Ans.* $631 gain.
13. 7550 ÷ 250 = 30 $\frac{50}{250}$ days.
14. 629 × 17 = 10693, coffee.
    11)10693 lbs.
    *Ans.* 972 $\frac{1}{11}$ lbs. sugar.
15. 530 × 3 = $1590 potatoes.
    $13)$1590(122 $\frac{4}{13}$ bar. flour.
16. $15260, amount.
    $4500, deducted.
    7)10760, balance.
    *Ans.* $1537 $\frac{1}{7}$, each.
17. 12 + 8 = 20;
    1200 ÷ 20 = 60 days.
18. $19 − $6 = $13;
    $13 × 12 = $156.
19. $23 × 6 = $138
    $2 × 150 = $300
    $4 × 75 = $300
    $7)$738(105 $\frac{3}{7}$ y.
20. 1361 bar. × $7 = $9527; $12249 − $9527 = $2722;
    $2722 ÷ 1361 = $2. *Ans.*
21. $3560 − $754 = $2806; $2806 ÷ 3 = $935 $\frac{1}{3}$. *Ans.*
22. $23268 − $1733 = $21535; $21535 ÷ 4 = $5383 $\frac{3}{4}$. *Ans.*
23. $42 × 30 = $1260; $1260 ÷ $5 = 252 sheep. *Ans.*
24. $123 × 3 = $369
    17 tons × $12 = $204
    bal. $165; $165 ÷ $4 = 41 $\frac{1}{4}$ bar. *Ans.*
25. 435 + 567 = 1002; 1002 ÷ 334 = 3; 3 × 217 = 651;
    651 ÷ 59 = 11 $\frac{2}{59}$. *Ans.*

*Page 71.*

26. 1530−319=1211; 1211 + 793=2004;
2004 × 44=88176; 88176÷37=2383$\frac{5}{37}$. *Ans.*

27. Income =$4250
Rent, $1365
Expenses, $1439 $2804
Balance, $1446 *Ans.* $1446÷$3=482 books.

28. Amount =$3038
15 tons, at $11 =$165
3 oxen, at $155= 465
375 sheep, at $5=1875 2505
Balance, $533
*Ans.* $533÷$41=13 cows.

## PROBLEMS IN FUNDAMENTAL RULES.

*Page 73.*

1. Given.
2. 746+411=1157 votes.

*Page 74.*

3. Given.
4. 1366−219=1147 votes.
5. Given.

Rods. Rods.
6. 320)51200
*Ans.* 160 rods.

*Page 75.*

7. Given.
8. 45 × 41 × 34=62730;
1944630÷62730=31 m.
9. Given.
10. $168 × 135=$22680.
11. Given.

*Page 76.*

12. 7620÷127=60. *Ans.*
13. Given.
14. $5368 − $976 = $4392;
$4392÷2=$2196 profit 1st year.
$2196 + $976 = $3172, profit 2d year.
15. 5564−708=4856;
4856÷2=2428, 1st can.
2428 + 708 = 3136, 2d candidate.
16. $250−$42=$208.
$208÷2=$104, chain.
$104+$42=$146, watch

17. 75 − 15 = 60;
60 ÷ 2 = 30, B's.
30 + 15 = 45, A's number.

18. $500 − $38 = $462.
$462 ÷ 2 = $231, B's sh.
$231 + $38 = $269, A's sh.

## ANALYSIS.

### *Page 78.*

1. 150 × $2 = $300, sheep.
$300 ÷ $20 = 15 cows.

2. 425 × 10 cts. = 4250 cts.
4250 cts. ÷ 85 cts. = 50 lbs. tea. *Ans.*

3. 288 × 18 cts. = 5184 cts., raisins.
5184 cts. ÷ 12 cts. = 432 lbs. sugar. *Ans.*

4. 160 × 30 cts. = 4800 cts., tobacco.
4800 cts. ÷ 80 cts. = 60 bu. corn. *Ans.*

5. 62 × 20 cts. = 1240 cts., calico.
1240 cts. ÷ 40 cts. = 31 lbs. butter. *Ans.*

6. 189 × 84 cts. = 15876 cts., linen.
15876 cts. ÷ 42 cts. = 378 bu. oats. *Ans.*

7. 30 × $6 = $180, cloth.
$180 ÷ 18 = $10. *Ans.*

8. 45 × $6 = $270.
$270 ÷ 15 = $18. *Ans.*

9. 35 × $27 = $945, hops.
45 × $14 = $630, coffee.
$315 *Ans.*

10. Since James paid 3 cts. for 4 apples, he paid for 96 apples as many times 3 cts. as there are times 4 in 96, viz.: 24 times. Now 24 × 3 = 72 cts., cost of apples; 72 cts. ÷ 4 = 18 pears. *Ans.*

11. Given.

### *Page 79.*

12. 504 ÷ 9 = 56;
56 − 25 = 31. *Ans.*

13. 58 × 8 = 464;
464 + 40 = 504. *Ans.*

14. 16 × 9 = 144;
144 − 23 = 121;
121 ÷ 11 = 11 children.

15. Given.

16. 72 ÷ 6 = 12 less;
12 × 5 = 60 greater.

17. Given.

18. $473 − $25 = $448;
$448 ÷ 4 = $112, B's.
$112 × 3 = $336;
$336 + $25 = $361, A's.

19. 243 + 25 = 268;
268 ÷ 4 = 67, 1st part.
67 × 3 = 201;
201 − 25 = 176, 2d part.

20. 2683--250=2433.

The question now is, what number is that to which, if 315 be added, the sum will be 2433?

*Ans.* 2433—315=2118.

## COMPLEMENT OF NUMBERS.

*Page 82.*

1. Next order, 1000
   minus 328 672
2. 1000—567=433. *Ans.*
3. 396.
4. 109.
5. 5362.
6. 3928.
7. 1744.
8. 939.
9. 86074.
10. 76816.
11. 43761.
12. 35877.
13. 897655.
14. 738564.
15. 59939.
16. 26755.
17. 8765433.
18. 7698794.
19. 6978762.
20. 2169574.

# FACTORING.

*Page 85.*

1. 35= 7× 5.
   49= 7× 7.
   121=11×11.
2. 45= 9×5.
   56= 8×7.
   72= 9×8.
   108=12×9.

*Page 86.*

4. 20=2×10; 4×5.
5. 27=3×9=3×3×3.
6. 30=2×15; 3×10; 5×6.
7. 32=2×16; 4×8.
8. 38=2×19.
9. 45=3×15; 5×9.
10. 56=2×28; 4×14; 7×8.
11. 75=3×25; 5×15.
12. 96=2×48; 3×32; 4×24; 6×16; 8×12.
13. 110=2×55; 5×22; 10×11.
14. 144=2×72; 3×48; 4×36; 6×24; 8×18; 9×16; 12×12.

15. $225=3\times75$; $5\times45$; $9\times25$; $15\times15$.
16. $256=2\times128$; $4\times64$; $8\times32$; $16\times16$.
17. $475=5\times95$.
18. $600=2\times300$; $3\times200$; $4\times150$; $5\times120$; $6\times100$; $8\times75$; $10\times60$; $12\times50$; $15\times40$; $20\times30$; $24\times25$.
19. $1240=2\times620$; $4\times310$; $5\times248$; $8\times155$; $10\times124$; $20\times62$; $31\times40$.

### *Page 87.*

1. Given.
2. $72=2\times2\times2\times3\times3$.
3. $96=2\times2\times2\times2\times2\times3$.
4. $121=11\times11$.
5. $132=2\times2\times3\times11$.
6. $144=2\times2\times2\times2\times3\times3$.
7. $184=2\times2\times2\times23$.
8. $215=5\times43$.
9. $320=2\times2\times2\times2\times2\times2\times5$.
10. $468=2\times2\times3\times3\times13$.
11. $576=2\times2\times2\times2\times2\times2\times3\times3$.
12. $1000=2\times2\times2\times5\times5\times5$.
13. $1208=2\times2\times2\times151$.
14. $1560=2\times2\times2\times3\times5\times13$.
15. $1776=2\times2\times2\times2\times3\times37$.
16. $1868=2\times2\times467$.
17. $2348=2\times2\times587$.
18. $10376=2\times2\times2\times1297$.
19. $25600=2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times5\times5$.
20. $64384=2\times2\times2\times2\times2\times2\times2\times503$.
21. $98816=2\times2\times2\times2\times2\times2\times2\times2\times2\times193$.
22. Given.

### *Page 88.*

23. 2 and 3. *Ans.*
24. 2 and 3. *Ans.*
25. 2 and 2. *Ans.*
26. None.
27. 2, 2, and 2. *Ans.*
28. 2, 3, and 2. *Ans.*
29. 5 and 3. *Ans.*
30. 2 and 2. *Ans.*
31. 2 and 2. *Ans.*
32. 5. *Ans.*
33. 2 and 2. *Ans.*
34. 2 and 3. *Ans.*
35. 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.
36. From 1 to 100 see last example. 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199.

# CANCELLATION.

*Page 90.*

1—3. Given.

4. 12 | 24, 2
7 | 6
7 | 12 = $1\frac{5}{7}$. *Ans.*

5. 21 | 42
2 | 8
| 8 *Ans.*

6. 12 | 18, 3
6 | 3
| 4
| 3 *Ans.*

7. 5 | 18, 3
6 | 15, 3
| 9 *Ans.*

8. 8 | 56, 7
4 | 16, 4
| 28 *Ans.*

9. 14 | 28, 2
2, 8 | 6, 3
| 12, 3
| 18 *Ans.*

10. 7 | 21
3 | 5
2 | 6, 3
| 15 *Ans.*

11. 8 | 32
5 | 7
4 | 9
5 | 63 = $12\frac{3}{5}$ *Ans.*

12. 9 | 27, 3
7 | 35, 5
7, 21 | 14, 2
| 10 *Ans.*

13. 7 | 33, 3
5 | 42, 6
11 | 25, 5
| 90 *Ans.*

14. 2, 96 | 36, 9
8 | 48
4 | 56, 7
2 | 5
4 | 315 = $78\frac{3}{4}$ *Ans.*

15. 9 | 63, 7
12 | 24, 2
11 | 33, 3
| 2
| 84 *Ans.*

16. 25 | 175, 7
14 | 28, 2
12 | 72, 6
| 84 *Ans.*

17. 13 | 220, 2
11 | 68, 5
12 | 48, 6
8 | 69
13 | 4140 = $318\frac{6}{13}$ *Ans.*

18. 50 | 350, 7
72 | 63, 21
4, 12, 24 | 144, 2
4 | 147 = $36\frac{3}{4}$ *Ans.*

19. 256 | 588, 2
256 | 128
12 | 42
| 588, 9
| 378 *Ans.*

20. 4, 12 | 48, 10
| 9, 3
| 30 bar.

21. 7, 56 | 8
14, 28 | 45
| 26, 13
98 | 585 = $5\frac{25}{98}$ tubs.

22. 7, 42 | 18
4 | 72, 18
| 6
7 | 324 = $46\frac{2}{7}$ bags.

23. 28 | 24, 3
2, 16 | 168, 6, 3
| 20
| 180 cheeses.

24. 2, 14 | 18, 5
| 63
| 7
| 315 bu.

25. 8 | 64, 8, 2
4 | 14
| 28 years.

26. 3, 68 | 188, 5
15 | 75, 5
3 | 25 = $8\frac{1}{3}$ times.

# COMMON DIVISORS.

***Page 91.***

1, 2. Given.

3. 12 = 3 × 4
15 = 3 × 5
18 = 3 × 6
30 = 3 × 10 *Ans.* 3.

4.
36 = 3 × 12 = 4 × 9 = 6 × 6
48 = 3 × 16 = 4 × 12 = 6 × 8
96 = 3 × 32 = 4 × 24 = 6 × 16
108 = 3 × 36 = 4 × 27 = 6 × 18
*Ans.* 3, 4, and 6.

5. 42 = 6 × 7
54 = 6 × 9
66 = 6 × 11
132 = 6 × 22 *Ans.* 6.

6. 21 = 7 × 3
28 = 7 × 4
35 = 7 × 5
49 = 7 × 7
63 = 7 × 9
*Ans.* 7.

7. 20 = 10 × 2
30 = 10 × 3
70 = 10 × 7
100 = 10 × 10
*Ans.* 10.

8. 60 = 3 × 5 × 4
75 = 3 × 5 × 5
120 = 3 × 5 × 8
240 = 3 × 5 × 16
*Ans.* 3 and 5.

$16 = 2 \times 8 = 4 \times 4$
$24 = 2 \times 12 = 4 \times 6$
$40 = 2 \times 20 = 4 \times 10$
$64 = 2 \times 32 = 4 \times 16$
$116 = 2 \times 58 = 4 \times 29$
$120 = 2 \times 60 = 4 \times 30$
$144 = 2 \times 72 = 4 \times 36$
$168 = 2 \times 84 = 4 \times 42$
$264 = 2 \times 132 = 4 \times 66$
$1728 = 2 \times 864 = 4 \times 432$

*Ans.* 2 and 4.

## GREATEST COMMON DIVISOR.

### *Page 93.*

1. Given.
2. The greatest common divisor of 48 and 72 = 24. Of 24 and 108=12. *Ans.*
3. 24.
4, 5. Given.

### *Page 94.*

6. 21.
7. 15.
8. 12.
9. 3.
10. 25.
11. 6.
12. 4.
13. 12.
14. 2.
15. 12.
16. 2.
17. 192.
18. 1.
19. 37.
20. 2.
21. 2040.
22. NOTE.—Since the patterns must be of equal length, and each is to contain the greatest possible number of yards, it is plain that the greatest common divisor of 180 and 234 will be the number of yards in each. Now the greatest common divisor of 180 and 234 is 18.

*Ans.* 18 yards.

23. The greatest common divisor of 42 and 63 is 21.

*Ans.* 21 ap. in each.

24. The greatest com. divisor of 56, 72, and 88 is 8.

*Ans.* 8 acres.

# MULTIPLES.

*Page 95.*

1. 30.
2. 231.
3. 455.
4. 160.
5. 714.
6. 7161.
7. 2002.
8. 1520.
9. 5780.

## LEAST COMMON MULTIPLE.

*Page 98.*

1, 2. Given.

3. 2)8, 12, 16, 24
2)8, 12
2)4, 6
2, 3
$2\times2\times2\times2\times3=48$. *Ans.*

4. 2)14, 28, 21, 42
7)14, 21
2, 3
$2\times7\times2\times3=84$. *Ans.*

5. 2)36, 24, 48, 60
3)18, 24, 30
2)6, 8, 10
3, 4, 5
$2\times3\times2\times3\times4\times5=720$.

6. 5)25, 40, 75, 100
2)8, 15, 20
2)4, 15, 10
5)2, 15, 5
2, 3, 1
$5\times2\times2\times5\times2\times3=600$.

7. 2)16, 24, 32, 40
2)12, 16, 20
2)6, 8, 10
3, 4, 5
$2\times2\times2\times3\times4\times5=480$.

8. NOTE.—In this example it will be seen that 22 and 33 are each factors of 66. Both may therefore be cancelled.
11)22, 33, 55, 66
5, 6
$11\times5\times6=330$. *Ans.*

9. 2)38, 48, 60, 80
2)30, 40
5)15, 20
3, 4
$2\times2\times5\times3\times4=240$. *Ans.*

10. 2)36, 48, 72, 96
2)36, 48
2)18, 24
3)9, 12
3, 4
$2\times2\times2\times3\times3\times4=288$.

*Page 98—Continued.*

11. 2)42, 68, 84, 108
2)34, 42, 54
3)17, 21, 27
17, 7, 9
$2 \times 2 \times 3 \times 17 \times 7 \times 9 =$ 12852. *Ans.*

12. 2)120, 144, 168, 216
2)60, 72, 84, 108
2)30, 36, 42, 54
3)15, 18, 21, 27
3)5, 6, 7, 9
5, 2, 7, 3
$2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 2 \times 7 \times 3 = 15120$. *Ans.*

13. 2)96, 108, 60, 204
2)48, 54, 30, 102
3)24, 27, 15, 51
8, 9, 5, 17
$2 \times 2 \times 3 \times 8 \times 9 \times 5 \times 17 =$ 73440. *Ans.*

14. 2)126, 154, 288, 560
7)63, 77, 280
9, 11, 40
$2 \times 7 \times 9 \times 11 \times 40 = 55440$.

15. 2)144, 256, 72, 300
2)72, 128, 150
2)36, 64, 75
2)18, 32, 75
3)9, 16, 75
3, 16, 25
$2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 16 \times 25 = 57600$. *Ans.*

16. The numbers 250 and 500 are factors of 1000.

5)250, 500, 1000

*Ans.* 1000.

17. ANALYSIS.—It is plain any sum which is a *common* multiple of the several prices will buy an exact number of each. Hence, the *least common* multiple of the several prices must be the *least sum* which will buy an exact number of each. Now the least common multiple of 4, 6, and 10 is 60. *Ans.* 60 cts.

18. 2)16, 18, 20, 24
2)8, 9, 10, 12
2)4, 9, 5, 6
3)2, 9, 5, 3
2, 3, 5, 1

*Ans.* $2 \times 2 \times 2 \times 3 \times 2 \times 3 \times 5 = 720$ rows.

19. In this example 4 and 6 are factors of 12. We therefore cancel them. 5 and 12 are prime to each other. Thus, $\frac{\cancel{4},\ 5,\ \cancel{6},\ 12}{5 \times 12} = 60$ lbs. *Ans.*

# FRACTIONS.

### *Page 102.*

1. Given.
2. 9, 11, 14, 22.
3. 5, 9, 16, 22.
4. 9, 9, 10, 9.
5. 6, 7, 19, 12.

### *Page 103.*

6, 7. Given.
8. 24, 36, 48.
9. 14, 24, 45.
10. 25, 35, 36, 63.

### *Case I. Page 105.*

1. Given.
2. $\frac{1}{2}$.
3. $\frac{2}{3}$.
4. $\frac{1}{3}$.
5. $\frac{5}{7}$.
6. $\frac{1}{7}$.
7. $\frac{21}{32}$.
8. $\frac{1}{4}$.
9. $\frac{1}{5}$.
10. $\frac{3}{4}$.
11. $\frac{121}{256}$.
12. The greatest common divisor is 96. $\frac{3}{4}$. *Ans.*
13. 1.
14. $\frac{1}{4}$.
15. $\frac{19}{31}$.
16. $\frac{11}{13}$.
17. $\frac{41}{83}$.
18. The greatest common divisor is 75. $\frac{8}{9}$. *Ans.*
19. $\frac{711}{1125}$.
20. $\frac{15}{34}$.
21. $\frac{1}{4}$.
22. $\frac{101}{250}$.
23. $\frac{1}{3}$.
24. The greatest common divisor is 1052. $\frac{2}{3}$. *Ans.*
25. The greatest common divisor is 115. $\frac{3}{8}$. *Ans.*
26. $\frac{800}{2000} = \frac{2}{5}$.
27. The greatest common divisor is 243. $\frac{5}{9}$. *Ans.*
28. The greatest common divisor is 20. $\frac{588}{1177}$. *Ans.*
29. $\frac{1}{7}$.

### *Case II. Page 105.*

1. Given.
2. 37.
3. $16\frac{1}{3}$.

4. 19.
5. $15\frac{1}{3}$.
6. 12.
7. 16.
8. $12\frac{5}{8}$.
9. $36\frac{11}{12}$.
10. $45\frac{2}{13}$.
11. $6\frac{1}{3}$.
12. $3\frac{18}{35}$.
13. $5\frac{5}{28}$.
14. $46\frac{5}{126}$.
15. $18\frac{113}{157}$.
16. $90\frac{10}{111}$.
17. $22\frac{17}{1165}$.
18. $210\frac{1}{9}$.
19. $107\frac{82}{127}$.
20. $383\frac{47}{64}$.
21. $20\frac{5}{6}$.
22. $2449\frac{24}{25}$.
23. $10\frac{3823}{4520}$.
24. $29\frac{3215}{4280}$.
25. $13\frac{3186\frac{1}{2}}{7285\frac{1}{2}}$.
26. $41\frac{41}{124}$ pounds.
27. $29\frac{2445}{6127}$ dollars.
28. 3516 years.

### *Case III. Page 106.*

1. Given.
2. $\frac{108}{7}$.
3. $\frac{94}{5}$.
4. $\frac{287}{8}$.
5. $\frac{1631}{20}$.
6. $\frac{2170}{63}$.
7. $\frac{13505}{72}$.
8. $\frac{29581}{100}$.
9. $\frac{88745}{110}$.
10. $\frac{7868}{5}$.
11. $\frac{17931}{7}$.
12. $\frac{29125}{8}$.
13. $\frac{86247}{10}$.
14. $\frac{39679}{83}$.
15. $\frac{14275}{280}$.
16. $\frac{3615}{411}$.
17. $\frac{94523}{10000}$.
18. $\frac{4211}{16}$ lb.
19. $\frac{25652}{40}$ m.

### *Case IV. Page 107.*

1, 2. Given.

3. $\frac{\cancel{5}}{\cancel{2,6}} \times \frac{\cancel{3}}{\cancel{10,2}} = \frac{1}{4}$. *Ans.*

4. $\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$. *Ans.*

5. $\frac{\cancel{4}}{\cancel{7}} \times \frac{\cancel{14,2}}{\cancel{20,5}} = \frac{2}{5}$. *Ans.*

6. $\frac{\cancel{3}}{\cancel{8}} \times \frac{\cancel{16,2}}{\cancel{27,9}} = \frac{2}{9}$. *Ans.*

7. $\frac{\cancel{3}}{7} \times \frac{13}{\cancel{15,5}} = \frac{13}{35}$. *Ans.*

8. $\frac{8}{9} \times \frac{7}{11} = \frac{56}{99}$. *Ans.*

9. $\frac{\cancel{5}}{\cancel{3}} \times \frac{7}{\cancel{25}\,\cancel{5}} \times \frac{\cancel{68}^{\,,4}}{1} = \frac{28}{1}$.

10. $\frac{\cancel{7}}{\cancel{9}} \times \frac{\cancel{27}^{\,,3}}{\cancel{35}\,5} \times \frac{13}{19} = \frac{39}{95}$. *Ans.*

11. $\frac{11}{17}\times\frac{21}{45}\times\frac{63}{84}=\frac{77}{340}$.

12. $\frac{13}{19}\times\frac{1}{2}\times\frac{42}{51}=\frac{273}{969}$.

13. $\frac{18}{22}\times\frac{4}{57}\times\frac{45}{1}=\frac{540}{209}$.

14. $\frac{2}{3}\times\frac{5}{7}\times\frac{11}{13}=\frac{110}{273}$. *Ans.*

15. $\frac{7}{12}\times\frac{48,4}{63,9}\times\frac{27,3}{32,8}=\frac{3}{8}$.

16. $\frac{3}{4}\times\frac{2}{3}\times\frac{4}{5}\times\frac{5}{9}=\frac{2}{9}$. *Ans.*

17. $\frac{32,8,2}{39,3}\times\frac{26,2}{44,11}\times\frac{261,87}{4}=\frac{348}{11}$. *Ans.*

18. $\frac{45}{55}\times\frac{22}{63}\times\frac{757}{9}=\frac{1514}{63}$.

19. $\frac{5}{8}\times\frac{42}{5}\times\frac{19}{20}=\frac{399}{80}$. *Ans.*

20. $\frac{7}{9,3}\times\frac{3}{5}\times\frac{655}{4}=\frac{917}{12}$.

21. $\frac{15}{22,2}\times\frac{44}{78,7}\times\frac{38,3}{44}\times\frac{77,11}{8}=\frac{3}{1}$.

22. $\frac{1}{7}\times\frac{21}{32}\times\frac{7}{2}=\frac{21}{64}$ bushels.

23. $\frac{2}{5}\times\frac{9}{2}\times\frac{3}{39,13}=\frac{9}{65}$ yds.

### *Case V. Page 108.*

1. Given.
2. $\frac{5}{13}\times\frac{4}{4}=\frac{20}{52}$. *Ans.*
3. $\frac{7}{12}\times\frac{5}{5}=\frac{35}{60}$. *Ans.*
4. $\frac{4}{11}\times\frac{8}{8}=\frac{32}{88}$. *Ans.*
5. $\frac{15}{24}\times\frac{6}{6}=\frac{90}{144}$. *Ans.*
6. $\frac{19}{34}\times\frac{6}{6}=\frac{114}{204}$. *Ans.*
7. $\frac{29}{41}\times\frac{6}{6}=\frac{174}{246}$. *Ans.*
8. $\frac{41}{72}\times\frac{4}{4}=\frac{164}{288}$. *Ans.*
9. $\frac{64}{90}\times\frac{4}{4}=\frac{256}{360}$. *Ans.*
10. $\frac{65}{100}\times\frac{10}{10}=\frac{650}{1000}$. *Ans.*
11. $\frac{119}{2000}\times\frac{5}{5}=\frac{595}{10000}$. *Ans.*
12. Given.
13. NOTE.—In this and similar examples it is advisable to *divide* both terms, etc.

$5\div 2=2\frac{1}{2}$;
$12\div 2=6$;
$\frac{2\frac{1}{2}}{6}$. *Ans.*

14. $7\div 3=2\frac{1}{3}$;
$9\div 3=3$;
$\frac{2\frac{1}{3}}{3}$. *Ans.*

15. $27 \div 9 = 3$.
3 times $8 = 24$;
3 times $9 = 27$.
$\frac{24}{27}$. *Ans.*

16. $11 \div 4 = 2\frac{3}{4}$.
$16 \div 4 = 4$;
$\frac{2\frac{3}{4}}{4}$. *Ans.*

### *Page 109.*

1. Given.
2. $7 \times \frac{2}{9} = \frac{63}{9}$. *Ans.*
3. $63 \times \frac{5}{8} = \frac{315}{8}$. *Ans.*
4. $79 \times \frac{7}{7} = \frac{553}{7}$. *Ans.*
5. $83 \times \frac{9}{9} = \frac{747}{9}$. *Ans.*
6. $105 \times \frac{16}{16} = \frac{1680}{16}$. *Ans.*
7. $217 \times \frac{20}{20} = \frac{4340}{20}$. *Ans.*
8. $321 \times \frac{49}{49} = \frac{15729}{49}$. *Ans.*
9. $468 \times \frac{76}{76} = \frac{35568}{76}$. *Ans.*
10. $500 \times \frac{87}{87} = \frac{43500}{87}$. *Ans.*
11. $1560 \times \frac{100}{100} = \frac{156000}{100}$.
12. $2004 \times \frac{1000}{1000} = \frac{2004000}{1000}$.
13. $500 \times \frac{10000}{10000} = \frac{5000000}{10000}$.
14. $25 \times \frac{1000000}{1000000} = \frac{25000000}{1000000}$

### *Case VI. Page 110.*

1, 2. Given.

3. $\frac{3\frac{3}{4}}{4} = \frac{15}{4} \div 4 = \frac{15}{16}$. *Ans.*

4. $\frac{2\frac{2}{3}}{25} = \frac{8}{3} \div 25 = \frac{8}{75}$. *Ans.*

5. $\frac{9\frac{1}{7}}{4} = \frac{64}{7} \div 4 = \frac{16}{7}$. *Ans.*

6. $\frac{\frac{24}{4}}{2} = \frac{24}{4} \div 2 = \frac{12}{4} = \frac{3}{1}$.

7. $\frac{\frac{108}{18}}{4} = \frac{108}{18} \div 4 = \frac{27}{18} = \frac{3}{2}$.

8. $\frac{\frac{168}{7}}{3} = \frac{168}{7} \div 3 = \frac{56}{7} = \frac{8}{1}$.

9. $\frac{2\frac{4}{5}}{7} = \frac{14}{5} \div 7 = \frac{2}{5}$. *Ans.*

10. $\frac{3\frac{10}{66}}{2} = \frac{208}{66} \div 2 = \frac{104}{66} = \frac{52}{33}$

11. $\frac{5\frac{10}{34}}{5} = \frac{180}{34} \div 5 = \frac{36}{34} = \frac{18}{17}$

12. $\frac{\frac{176}{11}}{4} = \frac{176}{11} \div 4 = \frac{44}{11} = \frac{4}{1}$.

13. $\frac{59\frac{1}{2}}{78} = \frac{119}{2} \div 78 = \frac{119}{156}$.

14. $\frac{5\frac{5}{296}}{9} = \frac{1485}{296} \div 9 = \frac{165}{296}$.

### *Case VII. Page 111.*

1. Given.
2. $\frac{3}{4} = \frac{15}{20}$, $\frac{2}{5} = \frac{8}{20}$.
3. $\frac{1}{2} = \frac{35}{70}$, $\frac{4}{5} = \frac{56}{70}$, $\frac{6}{7} = \frac{60}{70}$.
4. $\frac{2}{3} = \frac{154}{231}$, $\frac{3}{7} = \frac{99}{231}$, $\frac{4}{11} = \frac{84}{231}$.
5. $\frac{1}{2} = \frac{65}{130}$, $\frac{3}{5} = \frac{78}{130}$, $\frac{9}{13} = \frac{90}{130}$.
6. $\frac{5}{7} = \frac{935}{1309}$, $\frac{6}{11} = \frac{714}{1309}$, $\frac{6}{17} = \frac{462}{1309}$.
7. $\frac{2}{6} = \frac{1980}{5940}$, $\frac{4}{9} = \frac{2640}{5940}$, $\frac{5}{10} = \frac{2970}{5940}$, $\frac{4}{11} = \frac{2160}{5940}$.
8. $\frac{4}{7} = \frac{140880}{246840}$, $\frac{6}{8} = \frac{185480}{246840}$, $\frac{15}{40} = \frac{92240}{246840}$, $\frac{17}{11} = \frac{380080}{246840}$.

9. $\frac{25}{63}=\frac{1575}{2835}$,
$\frac{40}{45}=\frac{2520}{2835}$,
$\frac{75}{100}=\frac{2126}{2835}$.

10. $\frac{23}{32}=\frac{1392}{3080}$,
$\frac{19}{22}=\frac{1722}{3080}$,
$\frac{22}{308}=\frac{10348}{30800}$.

*Page 112.*

12. $3\frac{1}{7}=\frac{22}{7}=\frac{330}{105}$;
$1\frac{1}{3}=\frac{4}{3}=\frac{140}{105}$;
$2\frac{1}{5}=\frac{11}{5}=\frac{231}{105}$.

13. $6\frac{1}{2}=\frac{13}{2}=\frac{7436}{1144}$;
$7\frac{10}{11}=\frac{87}{11}=\frac{9048}{1144}$;
$\frac{2}{13}=\frac{176}{1144}$;
$\frac{3}{4}=\frac{858}{1144}$.

14. $\frac{2}{5}$ of $\frac{1}{7}=\frac{2}{35}=\frac{144}{2520}$;
$5\frac{1}{8}=\frac{41}{8}=\frac{12915}{25920}$;
$\frac{5}{9}=\frac{1400}{2520}$.

15. $5\frac{1}{2}=\frac{11}{2}=\frac{1463}{266}$;
$\frac{1}{7}$ of $8=\frac{8}{7}=\frac{304}{266}$;
$\frac{11}{19}=\frac{154}{266}$.

16. $\frac{3}{4}$ of $\frac{1}{2}$ of $\frac{9}{1}=\frac{27}{8}$;
$11\frac{1}{2}=\frac{23}{2}$; $\frac{3}{11}$.
$\frac{594}{176}$, $\frac{2024}{176}$, $\frac{48}{176}$.

17. $13\frac{1}{4}=\frac{53}{4}$; $\frac{17}{1}$;
$\frac{5}{7}$ of $\frac{2}{3}=\frac{10}{21}$.
$\frac{1113}{84}$, $\frac{1428}{84}$, $\frac{40}{84}$. *Ans.*

18. $2\frac{1}{4}=\frac{9}{4}$; $5\frac{3}{12}=\frac{63}{12}$; $2\frac{4}{5}=\frac{8}{3}$.
$\frac{324}{144}$, $\frac{756}{144}$, $\frac{384}{144}$. *Ans.*

20. $\frac{1}{4}=\frac{18}{72}$; $\frac{3}{8}=\frac{27}{72}$; $\frac{5}{9}=\frac{40}{72}$.

21. $\frac{5}{8}=\frac{60}{96}$; $\frac{7}{12}=\frac{56}{96}$;
$\frac{11}{16}=\frac{66}{96}$.

22. $\frac{2}{3}$ of $\frac{3}{5}=\frac{2}{5}=\frac{36}{90}$;
$\frac{16}{24}=\frac{2}{3}=\frac{60}{90}$.

23. $\frac{1}{6}$ of $\frac{54}{5},9=\frac{9}{5}=\frac{135}{75}$;
$\frac{8}{20}=\frac{2}{5}=\frac{30}{75}$.

24. $\frac{5}{8}=\frac{104}{168}$; $\frac{7}{12}=\frac{98}{168}$;
$\frac{13}{24}=\frac{91}{168}$.

25. $\frac{7}{20}=\frac{350}{1000}$; $\frac{45}{60}=\frac{3}{4}=\frac{750}{1000}$;
$\frac{119}{250}=\frac{476}{1000}$.

*Case VIII. Page 113.*

1, 2. Given.

3. Least com. multiple=84.
$\frac{2}{3}=\frac{56}{84}$, $\frac{3}{4}=\frac{63}{84}$, $\frac{5}{7}=\frac{60}{84}$.

4. Least com. multiple=4.
$\frac{1}{4}=\frac{1}{4}$, $\frac{5}{20}=\frac{1}{4}$, $\frac{3}{12}=\frac{1}{4}$.

5. Least com. multiple=45.
$\frac{2}{5}=\frac{18}{45}$, $\frac{2}{3}=\frac{30}{45}$, $\frac{5}{9}=\frac{25}{45}$.

6. Least com. mult.=126.
$\frac{3}{7}=\frac{54}{126}$, $\frac{2}{9}=\frac{28}{126}$, $\frac{9}{2}=\frac{567}{126}$.

7. Least com. multiple=20.
$\frac{7}{10}$ $=\frac{14}{20}$,
$\frac{9}{12}=\frac{3}{4}$ $=\frac{15}{20}$,
$\frac{4,2}{5}$ of $\frac{25,5}{2}=\frac{10}{1}=\frac{200}{20}$.

8. Least com. mult.=264.
$\frac{5}{11}=\frac{120}{264}$, $\frac{7}{8}=\frac{231}{264}$,
$\frac{2}{3}$ of $\frac{10}{1}=\frac{20}{3}=\frac{1760}{264}$.

9. Least com. multiple = 20.
$\frac{5}{4} = \frac{25}{20}$,
$\frac{14}{35} = \frac{2}{5} = \frac{8}{20}$,
$3\frac{1}{2} = \frac{7}{2} = \frac{70}{20}$,
$8\frac{3}{4} = \frac{35}{4} = \frac{175}{20}$.

10. $\frac{9}{5,\overline{10}}$ of $\frac{42,21}{5} = \frac{189}{25}$.
$\frac{7}{8}$ of $\frac{48,5}{1} = \frac{35}{1}$.
Least com. multiple = 25.
$\frac{189}{25}$, $\frac{875}{25}$. *Ans.*

11. $\frac{8}{40} = \frac{1}{5}$; $\frac{6}{30} = \frac{1}{5}$;
$\frac{14}{56} = \frac{1}{4}$; $5\frac{2}{8} = \frac{42}{8} = \frac{21}{4}$.
Least com. multiple = 20.
$\frac{4}{20}$, $\frac{4}{20}$, $\frac{5}{20}$, $\frac{105}{20}$. *Ans.*

12. Least com. mult. = 210.
$\frac{90}{210}$, $\frac{140}{210}$, $\frac{105}{210}$, $\frac{168}{210}$, $\frac{180}{210}$.

13. $9\frac{2}{3} = \frac{29}{3}$,
$11\frac{3}{4} = \frac{47}{4}$,
$\frac{5}{7}$ of $40 = \frac{200}{7}$.
Least com. multiple = 84.
$\frac{812}{84}$, $\frac{987}{84}$, $\frac{2400}{84}$. *Ans.*

14. $\frac{4}{10}$ of $13 = \frac{52}{10} = \frac{26}{5}$,
$\frac{25}{100} = \frac{1}{4}$,
$\frac{42}{120} = \frac{7}{20}$.
Least com. multiple = 20.
$\frac{104}{20}$, $\frac{5}{20}$, $\frac{7}{20}$. *Ans.*

15. $7\frac{3}{4} = \frac{31}{4}$,
$\frac{8}{12}$ of $17 = \frac{136}{12} = \frac{34}{3}$,
$\frac{44}{60} = \frac{11}{15}$.
Least com. multiple = 60.
$\frac{465}{60}$, $\frac{680}{60}$, $\frac{44}{60}$. *Ans.*

16. $\frac{49}{294} = \frac{1}{6}$,
$\frac{250}{750} = \frac{1}{3}$,
$\frac{1260}{5040} = \frac{1}{4}$.
Least com. multiple = 12.
$\frac{2}{12}$, $\frac{4}{12}$, $\frac{3}{12}$. *Ans.*

17. Least com. mult. = 5120.
$\frac{113}{256} = \frac{2260}{5120}$,
$\frac{269}{512} = \frac{2690}{5120}$, and $\frac{1447}{5120}$.

18. $\frac{150}{375} = \frac{2}{5}$,
$\frac{265}{400} = \frac{53}{80}$,
$\frac{1728}{3456} = \frac{1}{2}$.
Least com. multiple = 80.
$\frac{32}{80}$, $\frac{53}{80}$, $\frac{40}{80}$. *Ans.*

# ADDITION OF FRACTIONS.

***Page 114.***

2. $\frac{6}{7} + \frac{5}{7} + \frac{1}{7} = \frac{12}{7} = 1\frac{5}{7}$. *Ans.*

3. $\frac{5}{12} + \frac{7}{12} + \frac{1}{12} + \frac{11}{12} = \frac{24}{12} = 2$. *Ans.*

4. $\frac{7}{20} + \frac{3}{20} + \frac{9}{20} + \frac{11}{20} = \frac{30}{20} = 1\frac{10}{20} = 1\frac{1}{2}$. *Ans.*

5. $\frac{17}{100} + \frac{29}{100} + \frac{62}{100} + \frac{112}{100} = \frac{220}{100} = 2\frac{1}{5}$. *Ans.*

6. $\frac{47}{144} + \frac{63}{144} + \frac{116}{144} + \frac{265}{144} = \frac{491}{144} = 3\frac{59}{144}$. *Ans.*

7. $\frac{164}{256} + \frac{117}{256} + \frac{210}{256} + \frac{121}{256} = \frac{612}{256} = 2\frac{25}{64}$. *Ans.*

*Page 116.*

10. The least com. denom. of the fractions $\frac{7}{8}$, $\frac{5}{9}$, and $\frac{8}{12}$ or $\frac{2}{3}$, is 72.

$2\frac{7}{8}=2\frac{63}{72}$
$1\frac{5}{9}=1\frac{40}{72}$
$3\frac{8}{12}=3\frac{48}{72}$
$8\frac{7}{72}$ *Ans.*

11. The least com. denom. of the fractions $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}=12$.

$4\frac{2}{3}=4\frac{8}{12}$
$5\frac{3}{4}=5\frac{9}{12}$
$11\frac{5}{6}=11\frac{10}{12}$
$22\frac{1}{4}$ *Ans.*

12. The least com. denom. of $\frac{4}{10}$ or $\frac{2}{5}$, $\frac{3}{24}$ or $\frac{1}{8}$, and of $\frac{5}{8}$ is 40.

$27\frac{4}{10}=27\frac{16}{40}$
$8\frac{3}{24}=8\frac{5}{40}$
$46\frac{5}{8}=46\frac{25}{40}$
$82\frac{3}{20}$ *Ans.*

13. The least common denominator=420.

$\frac{19}{20}=\frac{399}{420}$
$\frac{47}{60}=\frac{329}{420}$
$\frac{53}{84}=\frac{265}{420}$
*Ans.* $\frac{993}{420}=2\frac{51}{140}$

14. The least common denominator=300.

$\frac{23}{50}=\frac{138}{300}$
$\frac{37}{75}=\frac{148}{300}$
$\frac{87}{100}=\frac{261}{300}$
*Ans.* $\frac{547}{300}=1\frac{247}{300}$

15. The least common denominator=12.

$19\frac{1}{4}=19\frac{3}{12}$
$47\frac{1}{2}=47\frac{6}{12}$
$68\frac{2}{3}=68\frac{8}{12}$
$135\frac{5}{12}$ *Ans.*

16. The least common denominator=70.

$24\frac{5}{7}=24\frac{50}{70}$
$10\frac{31}{35}=10\frac{62}{70}$
$68\frac{5}{14}=68\frac{25}{70}$
$103\frac{67}{70}$ *Ans.*

17. The least common denominator=20.

$207\frac{3}{4}=207\frac{15}{20}$
$62\frac{3}{5}=62\frac{12}{20}$
$49\frac{9}{10}=49\frac{18}{20}$
$320\frac{1}{4}$ *Ans.*

18. The least common denominator=72.

$175\frac{5}{8}=175\frac{45}{72}$
$207=207$
$368\frac{7}{9}=368\frac{56}{72}$
$751\frac{29}{72}$ *Ans.*

19. The least common denominator=120.

$45=45$
$67\frac{5}{24}=67\frac{25}{120}$
$37\frac{47}{60}=37\frac{94}{120}$
$554\frac{119}{120}$. *Ans.*

*Page 116—Continued.*

20. The least common denominator=48.

$\frac{1}{3}$ of $\frac{3}{4} = \frac{1}{4} = \frac{12}{48}$

$\frac{5}{6}$ of $\frac{7}{1} = \frac{35}{6} = \frac{280}{48}$

$\frac{1}{2}$ of $\frac{75}{8} = \frac{75}{16} = \frac{225}{48}$

Sum $= \frac{517}{48} = 10\frac{37}{48}$

21. Least common denominator=168.

$\frac{3}{8}$ of $\frac{5}{7} = \frac{15}{56} = \frac{45}{168}$

$\frac{3}{5}$ of $\frac{5}{9,3} = \frac{1}{3} = \frac{56}{168}$

$\frac{3}{4}$ of $\frac{7}{1} = \frac{21}{4} = \frac{882}{168}$

Sum $= \frac{983}{168} = 5\frac{143}{168}$

22. Least common denominator=16.

$\frac{5}{9}$ of $\frac{9}{2} = \frac{5}{2} = \frac{40}{16}$

$\frac{5}{8}$ of $\frac{3}{1} = \frac{15}{8} = \frac{30}{16}$

$\frac{7}{8}$ of $\frac{21}{2} = \frac{147}{16} = \frac{147}{16}$

Sum $= \frac{217}{16} = 13\frac{9}{16}$

23. The least common denominator=20.

$1\frac{3}{5} = 1\frac{12}{20}$

$2\frac{1}{4} = 2\frac{5}{20}$

$3\frac{3}{4} = 3\frac{15}{20}$

$\$7\frac{3}{5}$ *Ans.*

24. Least com. denom.=8.

$43\frac{5}{8} = 43\frac{5}{8}$

$27\frac{3}{4} = 27\frac{6}{8}$

$\$71\frac{3}{8}$ *Ans.*

25. Least com. denom.=40.

$\frac{3}{4} = \frac{30}{40}$

$\frac{7}{8} = \frac{35}{40}$

$\frac{11}{20} = \frac{22}{40}$

$\frac{4}{5} = \frac{32}{40}$

Sum $= \frac{119}{40} = 2\frac{39}{40}$ pounds.

26. Least com. denom.=4.

$17\frac{3}{4}$

$8\frac{1}{2} = 8\frac{2}{4}$

$25\frac{1}{4}$

*Ans.* $51\frac{1}{2}$ yds.

27. Least com. denom.=12

$18\frac{3}{4} = 18\frac{9}{12}$

$45\frac{3}{18} = 45\frac{2}{12}$

$150\frac{3}{4} = 150\frac{9}{12}$

275

$\$489\frac{2}{3}$ *Ans.*

28. Given.

29. The least common denominator=175.

$\frac{\frac{48}{4}}{2} = \frac{48}{4} \div 2 = \frac{6}{1} = 6$

$\frac{6\frac{6}{35}}{3} = \frac{216}{35} \div 3 = \frac{72}{35} = 2\frac{10}{175}$

$\frac{7\frac{21}{25}}{7} = \frac{196}{25} \div 7 = \frac{28}{25} = 1\frac{21}{175} = 9\frac{31}{175}$. *Ans.*

30. The least common denominator=45.

$$\frac{2\frac{2}{9}}{5} = \frac{20}{9} \div 5 = \frac{4}{9} = \frac{20}{45}$$

$$\frac{\frac{140}{5}}{7} = \frac{140}{5} \div 7 = \frac{20}{5} = \frac{180}{45}$$

$$\frac{6\frac{3}{5}}{3} = \frac{33}{5} \div 3 = \frac{11}{5} = \frac{29}{45}$$

$$\text{Ans. } \frac{299}{45} = 6\frac{29}{45}$$

# SUBTRACTION OF FRACTIONS.

*Page 117.*

1. Given.
2. $\frac{6}{40}$.
3. $\frac{14}{75}$.
4. $\frac{363}{263}$.
5. $\frac{102}{435}$.
6. $\frac{363}{804}$.
7. $\frac{235}{1000}$.

*Page 118.*

8, 9. Given.

10. The least common denominator is 72.

$$\frac{7}{8} = \frac{63}{72}$$
$$\frac{4}{9} = \frac{32}{72}$$
$$\text{Ans. } \frac{31}{72}$$

11. The least common denominator is 6.

$$5\frac{2}{3} = 5\frac{4}{6}$$
$$3\frac{1}{2} = 3\frac{3}{6}$$
$$\text{Ans. } 2\frac{1}{6}$$

12. The least common denominator is 12.

$$7\frac{1}{4} = 7\frac{3}{12}$$
$$5\frac{2}{3} = 5\frac{8}{12}$$
$$\text{Ans. } 1\frac{7}{12}$$

13. The least common denominator is 35.

$$23\frac{4}{5} = 23\frac{28}{35}$$
$$15\frac{3}{7} = 15\frac{15}{35}$$
$$\text{Ans. } 8\frac{13}{35}$$

14. Least com. denom.=150.

$$\frac{43}{50} = \frac{129}{150}$$
$$\frac{37}{75} = \frac{74}{150}$$
$$\text{Dif.} = \frac{55}{150} = \frac{11}{30} \quad \text{Ans.}$$

15. Least com. denom. is 1634.

$$5\frac{25}{38} = 5\frac{1075}{1634}$$
$$3\frac{14}{43} = 3\frac{532}{1634}$$
$$\text{Ans. } 2\frac{543}{1634}$$

16. Least com. denom. = 441.

$7\frac{11}{49} = 7\frac{279}{441}$

$4\frac{17}{63} = 4\frac{119}{441}$

*Ans.* $3\frac{160}{441}$

17. Least com. denom. = 110.

$6\frac{39}{55} = 6\frac{78}{110}$

$3\frac{23}{46} = 3 = 3\frac{55}{110}$

*Ans.* $3\frac{23}{110}$

18. Least com. denom. = 150.

$8\frac{64}{75} = 8\frac{128}{150}$

$5\frac{33}{50} = 5\frac{11}{50} = 5\frac{55}{150}$

*Ans.* $3\frac{73}{150}$

19. Least common denom. of 24 and 108 = 216.

$9\frac{68}{96} = 9\frac{17}{24} = 9\frac{153}{216}$

$7\frac{37}{108} = 7\frac{74}{216}$

(Art. 154, N.) *Ans.* $2\frac{79}{216}$

20. $56\frac{1}{2} = 56\frac{2}{4}$

$23\frac{3}{4} = 23\frac{3}{4}$

*Ans.* $32\frac{3}{4}$ pounds.

21. $165\frac{9}{10} = 165\frac{36}{40}$

$78\frac{3}{4} = 78\frac{30}{40}$

*Ans.* $87\frac{6}{40} = 87\frac{3}{20}$ a.

22. Given.

*Page 119.*

23. Borrowing 1 from 46, we have

$46 = 45\frac{2}{2}$

$7\frac{1}{2}$

*Ans.* $38\frac{1}{2}$

24. Borrowing 1 from 58, we have

$58 = 57\frac{4}{4}$

$20\frac{3}{4}$

*Ans.* $37\frac{1}{4}$

25. $84\frac{3}{7}$

$41$

*Ans.* $43\frac{3}{7}$

26. $150\frac{5}{9}$

$83$

*Ans.* $67\frac{5}{9}$

27. Borrowing 1 from 110, we have,

$110 = 109\frac{125}{125}$

$7\frac{29}{125}$

*Ans.* $102\frac{96}{125}$

28. $1000 = 999\frac{60}{60}$

$999\frac{45}{60}$

*Ans.* $\frac{15}{60} = \frac{1}{4}$

29. Given.

30. $\frac{2}{3}$ of $\frac{5}{8,4} = \frac{5}{12}$

$\frac{1}{2,4}$ of $\frac{2}{3} = \frac{1}{6} = \frac{2}{12}$

*Ans.* $\frac{3}{12} = \frac{1}{4}$

31. $\frac{5}{9}$ of $\frac{11}{28,4} = \frac{11}{36} = \frac{77}{252}$

$\frac{2}{7}$ of $\frac{5}{12,6} = \frac{5}{42} = \frac{30}{252}$

*Ans.* $\frac{47}{252}$

*Page 119—Continued.*

32. $\frac{6}{11}$ of $4\frac{1}{2} = \frac{3,6}{11}$ of $\frac{9}{2} = \frac{27}{11} = \frac{189}{77}$

$\frac{4}{7}$ of $\frac{3}{1} = \frac{12}{7} = \frac{132}{77}$

*Ans.* $\frac{57}{77}$

33. $\frac{7}{6,24}$ of $\frac{28,7}{1} = \frac{49}{6}$

$\frac{5}{3,9}$ of $\frac{21,7}{5} = \frac{7}{3} = \frac{14}{6}$

*Ans.* $\frac{35}{6} = 5\frac{5}{6}$

34. $\frac{9,18}{4,28}$ of $\frac{125,25}{2} = \frac{225}{4}$

$\frac{3}{3,15}$ of $\frac{65,13}{4} = \frac{13}{4}$

*Ans.* $\frac{212}{4} = 53$

35. $431\frac{3}{10} = 430\frac{52}{40}$

$256\frac{5}{8} = 256\frac{25}{40}$

$174\frac{27}{40}$ *Ans.*

36. $230\frac{11}{16} = 230\frac{11}{16}$

$119\frac{1}{2} = 119\frac{8}{16}$

*Ans.* $111\frac{3}{16}$ tons.

37. $58\frac{1}{8} = 58\frac{1}{8}$

$17\frac{5}{8} = 17\frac{5}{8}$

*Ans.* $40\frac{7}{8}$ gals.

38. Lady's money = $100

$8\frac{1}{4} = 8\frac{2}{8}$

$15\frac{1}{2} = 15\frac{4}{8}$

$46\frac{5}{8} = 46\frac{5}{8} = 70\frac{3}{8}$

*Ans.* $29\frac{5}{8}$

39. Given.

40. $\frac{11\frac{1}{4}}{5} = \frac{45}{4} \div 5 = \frac{9}{4} = \frac{36}{16}$

$\frac{4\frac{1}{2}}{8} = \frac{9}{2} \div 8 = \frac{9}{16}$

*Ans.* $\frac{27}{16} =$ $1\frac{11}{16}$. (Art. 152.)

41. $\frac{5\frac{1}{7}}{3} = \frac{36}{7} \div 3 = \frac{12}{7} = \frac{48}{28}$

$\frac{5\frac{1}{2}}{22} = \frac{11}{2} \div 22 = \frac{11}{44} = \frac{1}{4} = \frac{7}{28}$

*Ans.* $\frac{41}{28} = 1\frac{13}{28}$

# MULTIPLICATION OF FRACTIONS.

***Case I. Page 121.***

1, 2. Given.

3. $\frac{20}{8}=2\frac{1}{2}$.

4. $\frac{306}{43}=7\frac{5}{43}$.

5. $23\times 8 \quad =184$
$\frac{2}{3}\times 8=\frac{16}{3}= \quad 5\frac{1}{3}$
(Rem. 1st.) $189\frac{1}{3}$ *Ans.*

6. $357\frac{1}{2}$.

7. $583\frac{1}{3}$.

8. $\frac{63}{84,7}\times\frac{48,4}{}=\frac{63}{7}$ or $9\times 4$
$=36$. *Ans.* (Rem. 4.)

Cancelling the factor 12 in the denominator 84, and also in the multiplier 48, the example becomes $\frac{63}{7}\times 4$.

9. $\frac{2790}{35}=277\frac{1}{7}$.

10. $\frac{2292}{685}=48\frac{114}{685}$.

11. $98\times 26=2548$
$\frac{7}{10}\times 26= \quad 18\frac{1}{5}$
*Ans.* $2566\frac{1}{5}$

12. $85\times 48 \quad =4080$
$\frac{7}{23}\times 48=\frac{336}{23}= \quad 14\frac{14}{23}$
*Ans.* $4094\frac{14}{23}$

13. NOTE.—A fraction is multiplied by a number *equal* to its denominator by cancelling the denominator. (Art. 163, N. 3.)
*Ans.* 275.

14. $\$7\frac{3}{8}\times 8=\$60\frac{3}{8}$.

15. $\$25\times 9=\$225$
$\frac{3}{4}\times 9= \quad 6\frac{3}{4}$
*Ans.* $\$231\frac{3}{4}$

16. $\$48\frac{3}{4}\times 25=\$1218\frac{3}{4}$.

17. $\$29\times 27=\$783$
$\$\frac{4}{5}\times 27= \quad 21\frac{3}{5}$
*Ans.* $\$804\frac{3}{5}$

18. $\$45\frac{1}{2}\times 35=\$1592\frac{1}{2}$.

19. $\$1737\frac{1}{2}$.

20. $\$4537\frac{1}{2}$.

21. 6 doz. $=72$.
$\$75\frac{1}{4}\times 72=\$5418$.

***Case II. Page 123.***

1, 2. Given.

3. $65\times 3=195$;
$195\div 8=24\frac{3}{8}$. *Ans.*

4. $26\frac{7}{10}$. *Ans.*

5. 2)96
$3\frac{1}{2}$
288
48
336 *Ans.*

6. 3)87
$4\frac{2}{3}$
348
29
29
406 *Ans.*

7. NOTE.—In multiplying by the fractional part of a mixed number, it is often convenient to divide the multiplicand by the denominator, and setting the quotient under the product of the integral part, multiply it by 1 less than the numerator. Thus,

7)100 =mult.
$5\frac{3}{7}$

500 =prod. 5
$14\frac{2}{7}$= " $\frac{1}{7}$
$28\frac{4}{7}$= " $\frac{2}{7}$
$542\frac{6}{7}$ *Ans.*

8. $\$38 \times \frac{7}{10} = \$26\frac{3}{5}$. *Ans.*

9. 8)\$29 cost 1 ton.
$8\frac{5}{8}$

232 " 8 "
$3\frac{5}{8}$ " $\frac{1}{8}$ "
$14\frac{4}{8}$ " $\frac{4}{8}$ "
$\$250\frac{1}{8}$ " $8\frac{5}{8}$ " *Ans.*

10. $\$6429\frac{5}{6}$.
11. $549\frac{58}{63}$.
12. 1407.
13. $643\frac{52}{57}$.
14. $1256\frac{1}{4}$.

15. 4)79 mult.
$7\frac{3}{4}$

553 =prod. 7
$19\frac{3}{4}$= " $\frac{1}{4}$
$39\frac{2}{4}$= " $\frac{2}{4}$
$612\frac{1}{4}$ *Ans.*

16. 5)103 mult.
$9\frac{4}{5}$

927 =prod. 9
$20\frac{3}{5}$= " $\frac{1}{5}$
$61\frac{4}{5}$= " $\frac{2}{5}$
$1009\frac{2}{5}$ *Ans.*

17. 10)1001 mult.
$21\frac{7}{10}$

21021 =prod. 21
$100\frac{1}{10}$= " $\frac{1}{10}$
$600\frac{6}{10}$= " $\frac{6}{10}$
$21721\frac{7}{10}$ *Ans.*

18. 9)1864 mult.
$37\frac{5}{9}$

13048 =prod. 7
5592 = " 30
$207\frac{1}{9}$= " $\frac{1}{9}$
$828\frac{4}{9}$= " $\frac{4}{9}$
$70003\frac{5}{9}$ *Ans.*

***Case III. Page 124.***

1, 2. Given.

3. $\frac{5}{7} \times \frac{7}{9} = \frac{5}{9}$. *Ans.*

4. $\frac{8}{2,10} \times \frac{5}{16,2} = \frac{1}{4}$. *Ans.*

5. $\frac{10}{12} \times \frac{24,2}{3} = \frac{20}{3} = 6\frac{2}{3}$.

6. $\frac{11}{13} \times \frac{3}{7} = \frac{33}{91}$. *Ans.*

*Page 124—Continued.*

7. $\frac{\cancel{13}}{3,\cancel{24}} \times \frac{8}{\cancel{13}} = \frac{1}{3}$. *Ans.*

8. $\frac{\cancel{11}}{\cancel{17}} \times \frac{\cancel{51},3}{\cancel{77},7} = \frac{3}{7}$. *Ans.*

9. $\frac{17}{20} \times \frac{7}{11} = \frac{119}{220}$. *Ans.*

10. $\frac{21}{5,\cancel{45}} \times \frac{9}{11} = \frac{21}{55}$. *Ans.*

11. $\frac{\cancel{3}}{5} \times \frac{2}{\cancel{3}} \times \frac{\cancel{5}}{7} = \frac{2}{7}$. *Ans.*

12. $\frac{\cancel{5}}{4,\cancel{8}} \times \frac{\cancel{2}}{\cancel{10},2} \times \frac{3}{7} = \frac{3}{56}$.

13. $\frac{\overset{2}{\cancel{12}}}{\underset{5}{\cancel{30}}} \times \frac{\overset{9}{\cancel{45}}}{\underset{5}{\cancel{50}}} \times \frac{\overset{1}{\cancel{10}}}{\underset{21}{\cancel{42}}} = \frac{9}{105} = \frac{3}{35}$.

14. $\frac{\cancel{7}}{\cancel{28},4} \times \frac{13}{17} \times \frac{\cancel{33},5}{\cancel{65},9} = \frac{65}{612}$.

15. $\frac{\cancel{4}}{5}$ of $\frac{\cancel{3}}{7}$ of $\frac{\cancel{25},5}{1} \times \frac{2}{\cancel{3}} \times \frac{6}{7}$ of $\frac{3}{\cancel{4}} = \frac{180}{49} = 3\frac{\cancel{33}}{\cancel{49}}$. *Ans.*

16. $\frac{5}{8}$ of $\frac{\cancel{6}}{\cancel{15}}$ of $\frac{\cancel{100},25}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{5}}$ of $\frac{\cancel{10},5}{\cancel{12},2}$ of $\frac{\cancel{75}}{\cancel{4}} = \frac{625}{8} = 78\frac{1}{\cancel{8}}$.

17. $\frac{1}{\cancel{2}}$ of $\frac{2}{\cancel{3}}$ of $\frac{\cancel{45},9}{1} \times \frac{\cancel{3}}{\cancel{4}}$ of $\frac{8}{\cancel{10},2}$ $= \frac{18}{2} = 9$ cts. *Ans.*

18. $\frac{4,\cancel{16}}{\cancel{3}} \times \frac{\cancel{27},9}{\cancel{4}} = \$36$. *Ans*

19. $\frac{\cancel{193}}{\cancel{5}} \times \frac{\cancel{59}}{\cancel{7}} = \frac{11387}{\cancel{35}} =$ $203\frac{\cancel{19}}{\cancel{35}}$. *Ans.*

20. $\frac{\cancel{75}}{\cancel{2}} \times \frac{\cancel{75}}{\cancel{4}} = \frac{5625}{\cancel{8}} = 703\frac{1}{\cancel{8}}$.

21. $\frac{\cancel{125}}{\cancel{2}} \times \frac{\cancel{125}}{\cancel{4}} = \frac{15625}{\cancel{8}} =$ $1953\frac{1}{\cancel{8}}$. *Ans.*

22. $\frac{\cancel{663}}{\cancel{4}} \times \frac{\cancel{741}}{\cancel{8}} = \frac{491283}{\cancel{32}} =$ $15352\frac{\cancel{19}}{\cancel{32}}$. *Ans.*

23. Given.

24. $\frac{\cancel{9}\frac{1}{3}}{7} = \frac{28}{3} \div 7 = \frac{4}{3}$

$\frac{\cancel{2}\frac{1}{2}}{10} = \frac{5}{2} \div 10 = \frac{5}{20}$

$\frac{\cancel{4}}{3} \times \frac{\cancel{5}}{\cancel{20}} = \frac{1}{3}$. *Ans.*

25. $\frac{\cancel{54}}{\cancel{10}} = \frac{54}{10} \div 9 = \frac{6}{10}$ or $\frac{3}{5}$

$\frac{\cancel{5}\frac{1}{3}}{12} = \frac{16}{3} \div 12 = \frac{16}{36}$ or $\frac{4}{9}$

$\frac{\cancel{3}}{5} \times \frac{4}{\cancel{9},3} = \frac{4}{15}$. *Ans.*

## EXAMPLES FOR PRACTICE.

*Page 125.*

1. $\begin{array}{r|l} 4 & 3 \\ 2,6 & 1 \\ \hline 8 & 1 \end{array}$ $1 = \$\frac{1}{8}$. *Ans.*

2. $\begin{array}{r|l} 5 & 4 \\ 2,8 & 5 \\ \hline 2 & 1 \end{array}$ $1 = \$\frac{1}{2}$. *Ans.*

3. $\begin{array}{r|l} 4,12 & 18,5 \\ 2,\ 4 & 3 \\ \hline 8 & 5 \end{array}$ $5 = \$\frac{5}{8}$. *Ans.*

4. $23\frac{7}{8} = \frac{191}{8}$; $6\frac{1}{4} = \frac{25}{4}$;
$\frac{191}{8} \times \frac{25}{4} = \frac{4775}{32} = 149\frac{7}{32}$.

5. $42\frac{2}{11} = \frac{464}{11}$; $8\frac{4}{5} = \frac{44}{5}$.

$\begin{array}{r|l} 5 & 44,4 \\ 11 & 464 \\ \hline 5 & 1856 \end{array}$ $= 371\frac{1}{5}$. *Ans.*

6. $65\frac{5}{8} = \frac{525}{8}$; $9\frac{1}{7} = \frac{64}{7}$.

$\begin{array}{r|l} 8 & 525,75 \\ 7 & 64,8 \\ \hline & 600 \end{array}$ *Ans.*

7. $91\frac{4}{5} = \frac{459}{5}$; $43\frac{3}{7} = \frac{304}{7}$;
$\frac{459}{5} \times \frac{304}{7} = \frac{139536}{35} =$
$3986\frac{26}{35}$. *Ans.*

8. $164\frac{3}{8} = \frac{1315}{8}$; $75\frac{3}{10} = \frac{753}{10}$.

$\begin{array}{r|l} 8 & 1315,263 \\ 2,10 & 753 \\ \hline 16 & 198039 \end{array}$ $= 12377\frac{7}{16}$.

9. $200\frac{5}{9} = \frac{1805}{9}$; $86\frac{7}{20} = \frac{1727}{20}$

$\begin{array}{r|l} 9 & 1805,361 \\ 4,20 & 1727 \\ \hline 36 & 623447 \end{array}$ $= 17317\frac{35}{36}$

10. $\frac{4}{5}$ of $\frac{7}{8}$ of $\frac{3}{4}$ of $\frac{8}{9,3} \times \frac{5}{7}$ of $\frac{6,2}{11}$ of $\frac{4}{18,5} = \frac{4}{55}$. *Ans.*

11. $\frac{2}{7}$ of $\frac{7}{2} \times \frac{3}{5}$ of $\frac{77}{4} = \frac{231}{20} = 11\frac{11}{20}$. *Ans.*

12. $\frac{15}{8} \times \frac{27}{1} = \frac{405}{8} = \$50\frac{5}{8}$. *Ans.*

13. $\frac{33}{2} \times \frac{105}{4} = \frac{3465}{8} = 433\frac{1}{8}$ cts. *Ans.*

14. $\frac{19}{5} \times \frac{143}{3} = \frac{2717}{15} = \$181\frac{2}{15}$. *Ans.*

15. $3750 \times \frac{1}{5} =$ 750 lbs. tin.
$3750 \times \frac{4}{5} =$ 3000 lbs. copper. } *Ans.*

16. $\frac{45}{1} \times \frac{31}{2} \times \frac{11}{4} = \frac{15345}{8} = \$1918\frac{1}{8}$. *Ans.*

17. $\frac{6032}{10} \times \frac{297}{4} = \frac{1793583}{40} = 44839\frac{23}{40}$ ft. *Ans.*

# DIVISION OF FRACTIONS.

## *Case I. Page 126.*

1, 2. Given.

3. $\frac{16}{25} \div 4 = \frac{4}{25}$. *Ans.*

4. $\frac{22}{30} \div 9 = \frac{22}{270} = \frac{11}{135}$. *Ans.*

5. $\frac{49}{23} \div 21 = \frac{49}{483} = \frac{7}{69}$. *Ans.*

6. $\frac{88}{30} \div 33 = \frac{88}{990} = \frac{4}{45}$. *Ans.*

7. $\frac{150}{87} \div 25 = \frac{6}{87} = \frac{2}{29}$. *Ans.*

8. $\frac{268}{121} \div 67 = \frac{4}{121}$. *Ans.*

9. $\frac{350}{119} \div 70 = \frac{5}{119}$. *Ans.*

10. $\frac{488}{261} \div 81 = \frac{488}{21141}$. *Ans.*

11. $\frac{4060}{1327} \div 20 = \frac{203}{1327}$. *Ans.*

12. $\frac{523326}{123450} = \frac{26163}{61725}$. *Ans.*

13. $\frac{4003}{45631}$. *Ans.*

14. $\frac{11120}{111111} = \frac{160}{1887\frac{3}{3}}$. *Ans.*

15. 1 person is $\frac{1}{5}$ of 5 persons; therefore 1 person received $\frac{1}{5}$ of $\frac{7}{8}$ bar. And $\frac{1}{5}$ of $\frac{7}{8}$ bar. $= \frac{7}{8}$ bar. $\div 5 = \frac{7}{40}$ bar. *Ans.*

16. NOTE.—The analysis of this and the next two examples is similar to that of the 15th. In one case we multiply the denominator by the divisor; in the other we divide the numerator by it. (Art. 144, Prin. 6, 7.)
$\$\frac{84}{100} \div 12 = \$\frac{7}{100}$. *Ans.*

17. $\$\frac{8}{9} \div 7 = \$\frac{8}{63}$. *Ans.*

18. $\$45\frac{3}{4} = \$\frac{183}{4}$;
$\$\frac{183}{4} \div 6 = \$\frac{183}{24} = \$7\frac{5}{8}$.

## *Page 127.*

19. $80\frac{4}{13} = \frac{1044}{13}$;
$\frac{1044}{13} \div 12 = \frac{87}{13} = 6\frac{9}{13}$.

20. $76\frac{7}{29} = \frac{2211}{29}$;
$\frac{2211}{29} \div 14 = \frac{2211}{406} = 5\frac{181}{406}$.

21. $28\frac{4}{7} = \frac{200}{7}$;
$\frac{200}{7} \div 20 = \frac{10}{7} = 1\frac{3}{7}$. *Ans.*

22. $51\frac{2}{3} = \frac{155}{3}$;
$\frac{155}{3} \div 27 = \frac{155}{81} = 1\frac{74}{81}$.

23. $865\frac{3}{15} = \frac{12978}{15}$;
$\frac{12978}{15} \div 82 = \frac{12978}{1230} = 10\frac{1}{2}\frac{1}{0}\frac{1}{3}$. *Ans.*

24. $490\frac{4}{20} = \frac{2804}{20}$;
$\frac{2804}{20} \div 40 = \frac{2804}{800} = 12\frac{51}{200}$.

25. $758\frac{12}{25} = \frac{18962}{25}$;
$\frac{18962}{25} \div 48 = \frac{18962}{1200} = 15\frac{481}{600}$. *Ans.*

26. $975\frac{13}{40} = \frac{39013}{40}$;
$\frac{39013}{40} \div 63 = \frac{39013}{2520} = 15\frac{1213}{2520}$. *Ans.*

27. $1000\frac{25}{100} = \frac{100025}{100}$;
$\frac{100025}{100} \div 50 = \frac{100025}{5000} = 20\frac{1}{200}$. *Ans.*

28. $4684\frac{4}{5} = \frac{23424}{5}$;
$\frac{23424}{5} \div 68 = \frac{23424}{340} = 68\frac{76}{85}$. *Ans.*

29. $7896\frac{2}{3} = \frac{23690}{3}$;
$\frac{23690}{3} \div 25 = \frac{23690}{75} = 315\frac{13}{15}$. *Ans.*

30. $9684\frac{4}{5}=\frac{48424}{5}$;
$\frac{48424}{5}\div 84=\frac{48424}{420}=$
$115\frac{31}{105}$. *Ans.*

31. $\$42\frac{3}{8}=\$\frac{339}{8}$;
$\$\frac{339}{8}\div 5=\$\frac{339}{40}=\$8\frac{19}{40}$.

32. $\$756\frac{3}{4}=\$\frac{3027}{4}$;
$\frac{3027}{4}\div 6=\$\frac{3027}{24}=\$126\frac{1}{8}$.

33. $\$54\frac{4}{5}=\$\frac{274}{5}$;
$\$\frac{274}{5}\div 45=\$\frac{274}{225}=\$1\frac{49}{225}$.

### *Case II. Page 128.*

1. Given.
2. $95\times\frac{4}{3}=\frac{380}{3}=126\frac{2}{3}$.
3. $168\times\frac{12}{7}=\frac{2016}{7}=672$.
4. $245\times\frac{10}{7}=\frac{2450}{7}=350$.
5. $175\times\frac{15}{7}=\frac{2625}{7}=375$.
6. $261\times\frac{17}{3}=\frac{4437}{3}=1479$.
7. $348\times\frac{9}{7}=\frac{3132}{7}=447\frac{3}{7}$.
8. $576\times\frac{20}{7}=\frac{11520}{7}=$
$1645\frac{5}{7}$. *Ans.*
9. $1236\times\frac{35}{2}=\frac{43260}{2}=$
$21630$. *Ans.*
10. $6240\times\frac{100}{11}=\frac{624000}{11}=$
$56727\frac{3}{11}$. *Ans.*
11. Given.
12. $27\times\frac{5}{1}=135$. *Ans.*
13. $53\times\frac{9}{1}=477$. *Ans.*
14. $38\times\frac{7}{1}=266$. *Ans.*
15. $67\times\frac{12}{1}=804$. *Ans.*
16. Given.
17. $88\times\frac{5}{52}=\frac{440}{52}=8\frac{6}{13}$.
18. $100\times\frac{2}{25}=\frac{200}{25}=8$. *Ans.*
19. $785\times\frac{2}{125}=\frac{1570}{125}=12\frac{14}{25}$.
20. $1000\times\frac{2}{175}=\frac{2000}{175}=11\frac{3}{7}$.

### *Case III. Page 128.*

21. Given.
22. 9.
23. $3\frac{2}{11}$.
24. $3\frac{10}{17}$.
25. $4\frac{2}{19}$.

### *Page 130.*

1. Given.
2. $\frac{7}{6,12}\times\frac{14,7}{3}=\frac{49}{18}=2\frac{13}{18}$.
3. $\frac{4}{17}\times\frac{17}{3}=\frac{4}{3}=1\frac{1}{3}$. *Ans.*
4. $\frac{3}{35,5}\times\frac{42,7}{4}=\frac{21}{20}=1\frac{1}{20}$.
5. $\frac{11}{18,9}\times\frac{19}{5}=\frac{209}{45}=4\frac{29}{45}$.
6. $\frac{3,12}{21,63}\times\frac{59}{8,2}=\frac{59}{42}=1\frac{17}{42}$.
7. $\frac{15}{35,7}\times\frac{45,5}{9}=\frac{15}{7}=2\frac{1}{7}$.
8. $\frac{27}{42}\times\frac{9}{28}=\frac{243}{196}=1\frac{47}{196}$.
7
9. $\frac{21}{45,5}\times\frac{63,7}{42,2}=\frac{7}{10}$. *Ans.*
10. $\frac{75}{100}\times\frac{150}{25}=\frac{9}{2}=4\frac{1}{2}$.
2

***Page 130—Continued.***

11. $\frac{132,11}{256} \times \frac{512,2}{388,25} = \frac{22}{25}$.

12. $\frac{628,2}{149} \times \frac{1498,2}{314} = 4$.

13. $\frac{573}{1264} \times \frac{1867}{824} = \frac{1069791}{1041536} = 1\frac{28255}{1041536}$. *Ans.*

14. Given.

15. $4\frac{1}{2} = \frac{9}{2} \div \frac{8}{3}$,

$\frac{9}{2} \times \frac{3}{8} = \frac{27}{16} = 1\frac{11}{16}$. *Ans.*

16. $11\frac{1}{4} = \frac{45}{4} \div \frac{35}{17}$,

$\frac{9,45}{4} \times \frac{17}{35,7} = \frac{153}{28} = 5\frac{13}{28}$.

17. $15\frac{3}{4} = \frac{63}{4} \div \frac{41}{8}$,

$\frac{63}{4} \times \frac{8}{41,2} = \frac{126}{41} = 3\frac{3}{41}$.

18. $\frac{120\frac{5}{7}}{16\frac{1}{14}} = \frac{845}{7} \div \frac{225}{14}$.

$$\begin{array}{r|l} 7 & 845,169 \\ 45,225 & 14,2 \\ \hline 45 & 338 \end{array} = 7\frac{23}{45}.$$ *Ans.*

19. $\frac{6,3888}{2,18} \times \frac{5}{648} = 6$. *Ans.*

20. $\frac{9281}{4,2} \times \frac{2}{33} = \frac{9281}{66} =$ $140\frac{41}{66}$ rods. *Ans.*

21. $\frac{5121}{16,4} \times \frac{4}{121} = \frac{5121}{484} =$ $10\frac{281}{484}$. sq. r. *Ans.*

22. Given.

23.

| | |
|---|---|
| 5 | 4 |
| 7 | 3 |
| 3 | 1 |
| 7 | 9 |
| 1 | 3 |
| 245 | 108 |

$= \frac{108}{245}$ *Ans.*

24.

| | |
|---|---|
| 9 | 7 |
| 4 | 3 |
| 7 | 5 |
| 1 | 2 |
| 3 | 4 |
| 9 | 10 |

$= \frac{10}{9} = 1\frac{1}{9}$ *Ans.*

25.

| | |
|---|---|
| 7 | 5 |
| 9 | 9 |
| 2 | 9 |
| 1 | 2 |
| 2 | 3 |
| 17 | 4,2 |
| 119 | 270 |

$= \frac{270}{119} = 2\frac{32}{119}$.

26. Given.

27. $6\frac{1}{4} = \frac{25}{4} \times \frac{4}{3}$,

$8\frac{1}{4} = \frac{33}{4} \times \frac{11}{4}$,

$\frac{25}{4} \times \frac{4}{3} \times \frac{4}{33} \times \frac{4}{11} = \frac{400}{1089}$

## EXAMPLES FOR PRACTICE.

*Page 131.*

1. $13\frac{1}{3} \div 2\frac{1}{2} = \frac{8,\cancel{40}}{3} \times \frac{2}{\cancel{5}} = \frac{16}{3} = 5\frac{1}{3}$ mo. *Ans.*

2. $45\frac{1}{2} \div 5\frac{1}{4} = \frac{\cancel{91},13}{\cancel{2}} \times \frac{\cancel{4},2}{\cancel{21},3} = \frac{26}{3} = 8\frac{2}{3}$ lbs. *Ans.*

3. $\frac{\cancel{9},3}{\cancel{10},5} \times \frac{\cancel{4},2}{\cancel{3}} = \frac{6}{5} = \$1\frac{1}{5}$. *Ans.*

4. $125\frac{7}{8} \div 7\frac{1}{4} = \frac{1007}{\cancel{8},2} \times \frac{\cancel{4}}{29} = \frac{1007}{58} = 17\frac{21}{58}$ tons. *Ans.*

5. $13\frac{1}{8} = \frac{\cancel{105},15}{\cancel{8}} \times \frac{8}{\cancel{7}} = 15$ times. *Ans.*

6. $24\frac{9}{10} \div 8\frac{3}{5} = \frac{249}{\cancel{10},2} \times \frac{5}{43} = \frac{249}{86} = 2\frac{77}{86}$. *Ans.*

7. $\frac{\cancel{3},\cancel{45}}{\cancel{78},26} \times \frac{23}{\cancel{15}} = \frac{23}{26}$. *Ans.*

8. $\frac{\cancel{110},22}{\cancel{165},5} \times \frac{\cancel{33}}{19} = \frac{22}{19} = 1\frac{3}{19}$. *Ans.*

9. $45\frac{7}{8} \div 25\frac{3}{4} = \frac{367}{\cancel{8},2} \times \frac{\cancel{4}}{103} = \frac{367}{206} = 1\frac{161}{206}$. *Ans.*

10. $75\frac{3}{8} \div 1\frac{1}{2} = \frac{\cancel{603},201}{\cancel{8},4} \times \frac{\cancel{2}}{\cancel{3}} = \frac{201}{4} = 50\frac{1}{4}$ lbs. *Ans.*

11. $57\frac{3}{4} \div 1\frac{7}{8} = \frac{77,\cancel{231}}{\cancel{4}} \times \frac{\cancel{8},2}{\cancel{15},5} = \frac{154}{5} = 30\frac{4}{5}$ acres. *Ans.*

12. $57\frac{1}{2} \div 5\frac{3}{4} = \frac{5,\cancel{115}}{\cancel{2}} \times \frac{\cancel{4},2}{\cancel{23}} = 10$ lots. *Ans.*

13. $268\frac{3}{5} \div 6\frac{3}{8} = \frac{805,\cancel{2415}}{9} \times \frac{8}{\cancel{51},17} = \frac{6440}{153} = 42\frac{14}{153}$ yds.

14.

| | |
|---|---|
| 8 | 5 |
| 7 | 4 |
| 7,35 | 14 |
| 2 | 3 |
| 1 | 8 |
| 3,9 | 4 |
| 21 | 16 = $\frac{14}{21}$. *Ans.* |

15.

| | |
|---|---|
| 5 | 4 |
| 2,4 | 2 |
| 5 | 42,21 |
| 8,64 | 13 |
| 400 | 273 = $\frac{273}{400}$. *Ans.* |

## QUESTIONS FOR REVIEW.

*Page 132.*

1. $607\frac{1}{4}$ minus $563\frac{3}{8}$

$43\frac{7}{8}$, error. *Ans.*

2. $278\frac{3}{8}$ plus $340\frac{3}{4}$

Am't, $619\frac{1}{24}$

Supposed am't, $638\frac{1}{4}$

minus $619\frac{1}{24}$

Error, $19\frac{5}{24}$

3. $35\frac{3}{4}$ plus $23\frac{5}{8}$

$59\frac{3}{8}$ minus $8\frac{1}{2}$

*Ans.* $50\frac{7}{8}$

4. $47\frac{3}{10}$ plus $63\frac{4}{5}$

$111\frac{1}{10}$ minus $78\frac{1}{2}$

*Ans.* $32\frac{3}{5}$ acres.

5. $\frac{1\frac{2}{3}}{3\frac{3}{4}} = \frac{5}{3} \div \frac{15}{4}$.

$\frac{5}{3} \times \frac{4}{15,3} = \frac{4}{9}$.

$\frac{\frac{5}{6}}{3\frac{2}{6}} = \frac{5}{6} \div \frac{20}{6}$,

$\frac{5}{6} \times \frac{6}{20,4} = \frac{1}{4}$.

$\frac{4}{9} + \frac{1}{4} = \frac{16}{36} + \frac{9}{36} = \frac{25}{36}$. *Ans.*

6.

$\frac{6\frac{3}{5}}{4} = \frac{33}{5} \div 4 = \frac{33}{20} = \frac{66}{40}$

$\frac{4\frac{1}{2}}{12} = \frac{9}{2} \div 12 = \frac{9}{24}$, or $\frac{3}{8} = \frac{15}{40}$

$\frac{8}{5\frac{1}{3}} = 8 \div \frac{16}{3} = \frac{24}{16}$, or $\frac{1}{2} = \frac{60}{40}$

*Ans.* $3\frac{21}{40}$

7. $\frac{1}{4}$ of $\frac{11}{16} = \frac{11}{64}$, part sold.

$\frac{3}{4}$ of $\frac{11}{16} = \frac{33}{64}$, part left.

$\$48064 \times \frac{33}{64} = \$24783$ w.

8.

| | |
|---|---|
| | $75\frac{3}{8}$ |
| minus | $31\frac{1}{4}$ |
| | $44\frac{1}{8}$ acres. |
| plus | $42\frac{2}{3}$ |
| *Ans.* | $86\frac{19}{24}$ acres. |

9. $\frac{\frac{3}{5}}{\frac{2}{3}} = \frac{3}{5} \div \frac{2}{3} = \frac{9}{10} = 2\frac{43}{270}$,

$\frac{4\frac{5}{9}}{6} = \frac{41}{9} \div 6 = \frac{41}{54} = \frac{205}{270}$,

$\frac{243}{270} - \frac{205}{270} = \frac{38}{270} = \frac{19}{135}$.

10. $\frac{6}{3\frac{1}{2}} = \frac{6}{1} \div \frac{7}{2} = \frac{12}{7} = 1\frac{44}{84}$

$\frac{5\frac{1}{2}}{6} = \frac{11}{2} \div 6 = \frac{11}{12} = \frac{77}{84}$

*Ans.* $\frac{67}{84}$

11. $\frac{12\frac{1}{4}}{6\frac{1}{9}} = \frac{49}{4} \div \frac{55}{9} = \frac{441}{220}$,

$\frac{18\frac{1}{3}}{12\frac{1}{2}} = \frac{55}{3} \div \frac{25}{2}$,

$\frac{11,55}{3} \times \frac{2}{25,5} = \frac{22}{15}$,

$\frac{441}{220} - \frac{22}{15} = \frac{1323}{660} - \frac{968}{660} = \frac{355}{660} = \frac{71}{132}$. *Ans.*

12. $28\frac{5}{8} = \frac{229}{8}$,

$1\frac{3}{4} = \frac{7}{4}$,

$\frac{229}{8} \times \frac{7}{4} = \frac{1603}{32} = 50\frac{3}{32}$ bu.

Or, $28\frac{5}{8} \times \frac{7}{4} = \frac{1}{4}$ of $28\frac{5}{8} \times 7 = 50\frac{3}{32}$ bu.

13. $14\frac{83}{5} = \frac{743}{5}$; $16\frac{1}{2} = \frac{33}{2}$;

$\frac{743}{5} \times \frac{33}{2} = \frac{24519}{10} =$

$2451\frac{9}{10}$ ft. *Ans.*

14. $45\frac{7}{8} = \frac{367}{8}$; $18\frac{3}{4} = \frac{75}{4}$;

$\frac{367}{8} \times \frac{75}{4} = \frac{27525}{32} = 860\frac{5}{32}$ m.

15. $37\frac{1}{2} = \frac{75}{2}$; $2\frac{3}{4} = \frac{11}{4}$;

$\frac{75}{2} \times \frac{11}{4} = \frac{825}{8} = \$103\frac{1}{8}$.

*Page 133.*

16. $68\frac{19}{20} = 68\frac{57}{60}$

$13\frac{2}{3} = 13\frac{40}{60}$

Sum—dif. $= 55\frac{17}{60}$

$55\frac{11}{60} \div 2 = 27\frac{77}{120}$, less.

$27\frac{77}{120} + 13\frac{80}{120} = 41\frac{37}{120}$ gr.

17. $\frac{4\frac{1}{2}}{3\frac{1}{2}} = \frac{9}{2} \div \frac{7}{2} = \frac{9}{7}$,

$\frac{2\frac{1}{3}}{4\frac{1}{4}} = \frac{7}{3} \div \frac{17}{4} = \frac{28}{51}$,

$\frac{3,9}{7} \times \frac{28,4}{51,17} = \frac{12}{17}$.

Or, $\frac{3,9}{2} \times \frac{2}{7} \times \frac{7}{3} \times \frac{4}{17} = \frac{12}{17}$.

18. $\frac{4}{6\frac{2}{3}} = 4 \div \frac{20}{3}$,

$\frac{5\frac{1}{3}}{12} = \frac{16}{3} \div 12$,

$\frac{4}{1} \times \frac{3}{20,5} \times \frac{16,4}{3} \times \frac{1}{12} = \frac{4}{15}$.

19. $\frac{18\frac{1}{3}}{12\frac{1}{2}} = \frac{55}{3} \div \frac{25}{2}$,

$\frac{25}{35} = \frac{25}{33} \div 11$,

$\frac{5,55}{3} \times \frac{2}{25} \times \frac{25}{35,7} \times \frac{5}{11} = \frac{10}{21}$.

20. $\frac{5,100}{1} \times \frac{16}{20} = 80$ d. work.

21. $\frac{1}{3}$ of $\frac{9,3}{10} = \frac{3}{10}$ sold.

$\$12\frac{3}{8} \div 3 = \$4\frac{1}{8}$, price $\frac{1}{10}$.

$\$4\frac{1}{8} \times 10 = \$41\frac{1}{4}$. *Ans.*

***Page 133—Continued.***

22. $\begin{array}{r|l} 2 & 47 \\ 3 & 18 \\ 5 & 8 \\ 21 & 4 \\ \hline 63 & 1504 \end{array} = 23\frac{15}{63}$. *Ans.*

23. $\begin{array}{r|l} 4 & 3 \\ 4 & 75,15 \\ 4 & 5 \\ 4,28 & 16 \\ 5 & 9 \\ 284 & 9 \\ \hline 4544 & 3645 \end{array} = \frac{3645}{4544}$. *Ans.*

24. $\frac{19}{10,28} \times \frac{2}{11} = \frac{19}{110}$. *Ans.*

25. $\frac{25,125}{4} \times \frac{8,2}{5} = 50$ vests.

26. $\frac{247}{4} \times \frac{8,2}{11} = \frac{494}{11} =$ $44\frac{10}{11}$ cans. *Ans.*

27. $\frac{151,453}{2,18} \times \frac{5}{18,6} =$ $\frac{151}{12} = 12\frac{7}{12}$ hours. *Ans.*

28. $\frac{95,5}{6,3} \times \frac{28,10}{19} = \frac{50}{3} = 16\frac{2}{3}$.

29. $\frac{6}{1} \times \frac{25,5}{4} \times \frac{8,2}{5} = 60$ bu.

30. $330\frac{6}{10} = \frac{3306}{10}$;
$16\frac{2}{3} = \frac{50}{3}$; $22\frac{1}{2} = \frac{45}{2}$.

$\begin{array}{r|l} 10 & 3306,1102 \\ 3 & 50,5 \\ 9,45 & 2 \\ \hline 9 & 2204 \end{array}$ *Ans.* $= 244\frac{8}{9}$ yds.

31. $\frac{25}{2} \times \frac{8}{25} \times \frac{4,2}{25} \times \frac{25}{8} = 2$.

32. $6\frac{1}{4} = \frac{25}{4} \times \frac{4}{3}$,
$8\frac{1}{4} = \frac{33}{4} \times \frac{11}{4}$,
$\frac{25}{4} \times \frac{4}{3} \times \frac{4}{33} \times \frac{4}{11} =$
$\frac{400}{1089}$. *Ans.*

33. $\frac{3\frac{1}{2}}{4} = \frac{7}{2} \div 4$,
$\frac{12}{3\frac{1}{2}} = 12 \div \frac{7}{2}$,
$\frac{25}{2} \times \frac{7}{2} \times \frac{1}{4} \times \frac{1}{12} \times \frac{7}{2} =$
$\frac{1225}{384} = 3\frac{73}{384}$. *Ans.*

# FRACTIONAL RELATION OF NUMBERS.

### *Page 134.*

1, 2. Given.

3. $\frac{15}{75}$ or $\frac{1}{5}$. *Ans.*
$\frac{20}{84}$ or $\frac{5}{14}$. *Ans.*

4. $\frac{63}{91}$ or $\frac{9}{13}$. *Ans.*

5. $\frac{72}{48}$ or $\frac{3}{2}$. *Ans.*

6. $\frac{18}{81}$ or $\frac{2}{9}$. *Ans.*

7. $\frac{75}{100}$ or $\frac{3}{4}$. *Ans.*

8. $\frac{72}{256}$ or $\frac{9}{32}$. *Ans.*

9. $\frac{42}{35}\frac{5}{15}$ or $\frac{17}{15}$. *Ans.*

10. $\frac{5}{7}$ weeks. *Ans.*

11. $\frac{5}{17}$ bushel. *Ans.*

12. $\frac{10}{13}$ ton. *Ans.*

13. $\frac{17}{51}$ or $\frac{1}{3}$. *Ans.*

### *Page 135.*

14. Given.

15. 28 bar. are $\frac{28}{5}$ of 5 bar.
Now $\frac{1}{5}$ of \$45 = \$9.
$\frac{28}{5}$ or 28 times \$9 = \$252. *Ans.*

16. 17 yds. are $\frac{17}{50}$ of 50 yds.
Now $\frac{1}{50}$ of \$175 = \$3½.
$\frac{17}{50}$ are 17 times \$3½ = \$59½. *Ans.*

17. 110 bu. are $\frac{110}{25}$ of 25 bu.
Now $\frac{1}{25}$ of \$30 = \$1⅕.
$\frac{110}{25}$ are 110 times \$1⅕ = \$132. *Ans.*

18. Given.

19. $\frac{7}{8} \div 25 = \frac{7}{200}$. *Ans.*

20. $\frac{15}{4} \div 35 = \frac{15}{140} = \frac{3}{28}$. *Ans.*

21. $\frac{9}{10} \div 30 = \frac{9}{300} = \frac{3}{100}$.

22. $\frac{24}{5} \div 40 = \frac{24}{120} = \frac{1}{5}$. *Ans.*

23. Given.

24. 1 ton is $\frac{1}{15}$ of 15 tons; hence, the cost of $\frac{4}{5}$ ton is $\frac{4}{5}$ of $\frac{1}{15}$ of 15 tons, or $\frac{4}{75}$ of 1 ton.
Now $\frac{1}{75}$ of \$95 = \$95 ÷ 75 = \$1$\frac{4}{75}$; and $\frac{4}{75}$ are 4 times \$1$\frac{4}{75}$ = \$5$\frac{1}{75}$. *Ans.*

25. 1 yd. is $\frac{1}{19}$ of 19 yds.; hence, the cost of $\frac{7}{8}$ yd. is $\frac{7}{8}$ of $\frac{1}{19}$ of 19 yds., or $\frac{7}{152}$ of the cost of 1 yd.
Now $\frac{1}{152}$ of \$60 = \$$\frac{60}{152}$; $\frac{7}{152} = 7$ times \$$\frac{60}{152}$ = \$$\frac{420}{152}$ or \$2$\frac{29}{38}$. *Ans.*

26. Given.

27. $8 \div \frac{3}{4} = \frac{32}{3}$. *Ans.*

28. $12 \div \frac{5}{8} = \frac{96}{5}$. *Ans.*

29. $11 \div \frac{4}{7} = \frac{77}{4}$. *Ans.*

30. $20 \div \frac{10}{7} = \frac{200}{7}$. *Ans.*

31. Given.

32. $\frac{2}{7} \div \frac{5}{8} = \frac{2}{7} \times \frac{8}{5} = \frac{16}{35}$. *Ans.*

33. $\frac{27}{63} \div \frac{28}{35} = \frac{27}{9,63} \times \frac{35,5}{28} = \frac{135}{252} = \frac{15}{28}$. *Ans.*

34. $\frac{9}{34} \div \frac{15}{17} = \frac{9}{34_2} \times \frac{17}{15_5}$
$= \frac{3}{10}$. *Ans.*

35. $\frac{38}{63} \div \frac{33}{48} = \frac{38}{21_{63}} \times \frac{48_{16}}{33}$
$= \frac{608}{693}$. *Ans.*

*Page 136.*

36. Given.

37. $12\frac{1}{2} = \frac{25}{2} \div 100 = \frac{25}{2} \times$
$\frac{1}{4_{100}} = \frac{1}{8}$. *Ans.*

38. $33\frac{1}{3} = \frac{100}{3} \div 100 = \frac{100}{3} \times$
$\frac{1}{100} = \frac{1}{3}$. *Ans.*

39. $16\frac{2}{3} = \frac{50}{3} \div 100 = \frac{50}{3} \times$
$\frac{1}{100_2} = \frac{1}{6}$. *Ans.*

40. $62\frac{1}{2} = \frac{125}{2} \div 100 = \frac{5_{125}}{2}$
$\times \frac{1}{100_4} = \frac{5}{8}$. *Ans.*

41. $18\frac{3}{4} = \frac{75}{4} \div 100 = \frac{3_{75}}{4} \times$
$\frac{1}{100_4} = \frac{3}{16}$. *Ans.*

42. $87\frac{1}{2} = \frac{175}{2} \div 100 =$
$\frac{175_7}{2} \times \frac{1}{100_4} = \frac{7}{8}$. *Ans.*

44. $62\frac{1}{2} = \frac{125}{2}$; $18\frac{3}{4} = \frac{75}{4}$,
$\frac{75}{4} \div \frac{125}{2} = \frac{75_3}{2_1} \times$
$\frac{2}{125_5} = \frac{3}{10}$. *Ans.*

45. $87\frac{1}{2} = \frac{175}{2}$; $31\frac{1}{4} = \frac{125}{4}$,
$\frac{125}{4} \div \frac{175}{2} = \frac{5_{125}}{2_1} \times$
$\frac{2}{175_7} = \frac{5}{14}$. *Ans.*

46. $\frac{3}{4} \div \frac{19}{20} = \frac{3}{4} \times \frac{{}^{5}20}{19} = \frac{15}{19}$ lb.

47. $\frac{12}{16} \div \frac{15}{40} = \frac{12}{16} \times \frac{{}^{2}40}{15} = 2$ ft.

48. $18\frac{3}{4} = \frac{75}{4}$; $62\frac{1}{2} = \frac{125}{2}$,
$\frac{75}{4} \div \frac{125}{2} = \frac{75_3}{4_2} \times$
$\frac{2}{125_5} = \frac{3}{10}$ lb. *Ans.*

49. 1 day is $\frac{1}{8}$ of 8 days; therefore in 1 day A will do $\frac{1}{8}$ of the job. For the same reason, B will do $\frac{1}{6}$ in 1 day. Now $\frac{1}{8}$ and $\frac{1}{6}$ are $\frac{7}{24}$. *Ans.*

50. $4 \times 20 = 80$; $9 \times 16 = 144$
$\frac{144}{80} = \frac{9}{5}$. *Ans.*

51. $\frac{105}{25} \div 75 \times 18 =$
$\frac{\cancel{105}}{25} \times \frac{1}{\cancel{75}} \times 18 = \frac{7}{2250}$.
$\cancel{7}$
$\cancel{75}$
5

52. $68 - 24 = 44$;
$44 \times 14 = 616$;
$168 \div 12 = 14$;
$14 \div 616 = \frac{14}{616} = \frac{1}{44}$.

### *Page 137.*

1, 2. Given.

3. $56 \div \frac{2}{3} = 16 \times \frac{3}{2} = 84$.

4. $68 \div \frac{3}{4} = 68 \times \frac{4}{3} = 90\frac{2}{3}$.

5. $85 \div \frac{2}{5} = 85 \times \frac{5}{2} = 212\frac{1}{2}$.

6. $115 \div \frac{5}{6} = 115 \times \frac{6}{5} = 138$.

7. $436 \div \frac{3}{7} = 436 \times \frac{7}{3} = 1017\frac{1}{3}$

8. $456 \div \frac{5}{8} = 456 \times \frac{8}{5} = 729\frac{3}{5}$.

9. $685 \div \frac{3}{10} = 685 \times \frac{10}{3} =$
$2283\frac{1}{3}$. *Ans.*

10. $999 \div \frac{7}{16} = 999 \times \frac{16}{7} =$
$2283\frac{3}{7}$. *Ans.*

11. $126 \div \frac{7}{15} = 126 \times \frac{15}{7} =$
270 eggs. *Ans.*

12. $8280 \div \frac{9}{16} = 8280 \times \frac{16}{9} =$
\$14720. *Ans.*

13. $\frac{7}{7} - \frac{5}{7} = \frac{2}{7}$. Hence, $\frac{1}{7} =$
9500 ÷ 2, or 4750,
and $\frac{7}{7} = 4750 \times 7$, or
33250 men.
Or $9500 \div \frac{2}{7} = 9500 \times \frac{7}{2} =$
33250 men. *Ans.*

14, 15. Given.

16. Since $\frac{35}{45}$ is $\frac{5}{9}$ of a certain number, that number must be equal to as many units as $\frac{3}{5}$ is contained times in $\frac{35}{45}$; and
$\frac{35}{45} \div \frac{3}{5} = \frac{\cancel{35}}{\cancel{45}} \times \frac{5}{3} = \frac{25}{27} =$
$1\frac{8}{27}$. *Ans.*

17. Analyzed as above, we have $\frac{72}{96} \div \frac{5}{8} =$
$\frac{\cancel{72}}{\cancel{96}} \times \frac{8}{5} = \frac{6}{5}$, or $1\frac{1}{5}$.

18. Given.

19. $37\frac{1}{2} = \frac{75}{2}$,
$\frac{75}{2} \div \frac{3}{5} = \frac{75}{2} \times \frac{5}{3} =$
$\frac{125}{2} = 62\frac{1}{2}$. *Ans.*

20. $66\frac{2}{3} = \frac{200}{3}$; $\frac{200}{3} \div \frac{4}{5} =$
$\frac{200}{3} \times \frac{5}{4} = \frac{250}{3} = 83\frac{1}{3}$.

21. Given.

### *Page 138.*

22. $\frac{7}{8}$ of $\frac{4}{9} = \frac{28}{72}$ or $\frac{7}{18}$. Now,
$112 \div \frac{7}{18} = 112 \times \frac{18}{7} =$
288. *Ans.*

23. Given.

24. $\frac{7}{8}$ of \$100 = \$$\frac{700}{8}$;
\$$\frac{700}{8}$ ÷ \$9 = $9\frac{1}{18}$ yds. *Ans.*

25. $\frac{9}{10}$ of \$280 = \$252;
\$252 ÷ 84 = \$3. *Ans.*

27. $125 \div \frac{5}{8} = 225$;
$225 \div 20 = 11\frac{1}{4}$ t. *Ans.*

28. Since 60 cts. are $\frac{6}{10}$ of his money, $\frac{1}{10}$ is $\frac{1}{6}$ of 60 or 10 cts.; and $\frac{10}{10} = 100$ cts.;
100 cts. $-$ 60 cts. $=$ 40 cts.;
40 cts. $\div 5 = 8$ cigars.

30. $\frac{7}{8}$ of $126 = 98$;
$98 \div \frac{3}{4} = 98 \times \frac{4}{3} = 130\frac{2}{3}$.

31. Given.

32. $\frac{7}{8}$ of $96 = 84$;
$84 \div \frac{6}{10} = 140$;
$140 \div 20 = 7$ times. *Ans.*

33. Given.

34. $\frac{5}{7}$ of $35 = 25$; $25 \div \frac{5}{8} = 40$;
$\frac{1}{10}$ of $120 = 12$;
$40 \div 12 = 3\frac{1}{3}$ tenths.

# DECIMAL FRACTIONS.

*Page 142.*

1. .7. *Ans.*
2. .11. *Ans.*
3. .49. *Ans.*
4. .65. *Ans.*
5. .03. *Ans.*
6. .07. *Ans.*
7. .99. *Ans.*
8. 4.7. *Ans.*
9. 21.06. *Ans.*
10. 84.45. *Ans.*
11. 93.009. *Ans.*
12. 7.045. *Ans.*
13. 10.00508. *Ans.*
14. 46.0007. *Ans.*
15. 80.000364.
17. .06; .063; .0109.
18. .305; .00021; .000095.
19. .004; .0108; .46; .000065; .0001045.
20. 69.004; 10.0075; 160.000006.
21. .0053; 63.00028; .0000352.

## REDUCTION OF DECIMALS.

*Page 144.*

1, 2. Given.
3. $\frac{128}{1000} \div 8 = \frac{16}{125}$. *Ans.*
4. $\frac{256}{1000} \div 8 = \frac{32}{125}$.
5. $\frac{375}{1000} \div 125 = \frac{3}{8}$.
6. $\frac{863}{1000}$.
7. $\frac{5}{100} = \frac{1}{20}$.
8. $\frac{3}{1000}$.
9. $\frac{8}{10000} = \frac{1}{1250}$.
10. $\frac{605}{10000} \div 5 = \frac{121}{2000}$.
11. $\frac{7}{10000}$.
12. $\frac{4056}{100000} \div 8 = \frac{507}{12500}$.

13. $\frac{364}{1000000} \div 4 = \frac{91}{250000}$.
14. $\frac{5}{1000000} = \frac{1}{200000}$.
15. $\frac{200684}{1000000} \div 4 = \frac{50171}{250000}$.
16. $\frac{8}{10000000} = \frac{1}{1250000}$.
17. $\frac{124000625}{1000000000} \div 625 = \frac{19841}{160000}$.
18. $\frac{248012264}{1000000000} \div 16 = \frac{15500079}{62500000}$.

*Page 145.*

2. $\frac{1}{4} = .25$.
3. $\frac{2}{5} = .4$.
4. $\frac{3}{4} = .75$.
5. $\frac{4}{5} = .8$.
6. $\frac{5}{8} = .625$.
7. $\frac{3}{12} = .25$.
8. $\frac{7}{8} = .875$.
9. $\frac{12}{15} = .8$.
10. $\frac{19}{20} = .95$.
11. $\frac{30}{50} = .6$.
12. $\frac{7}{80} = .0875$.
13. $\frac{3}{150} = .02$.
14. $\frac{3}{8000} = .000375$.
15. $\frac{2}{256} = .0078125$.
16. $\frac{7}{800} = .00875$.
17. $\frac{18}{1600} = .01125$.

*Page 146.*

18, 19. Given.
20. $\frac{1}{3} = .3333+$.
21. $\frac{5}{6} = .8333+$.
22. $\frac{2}{7} = .2857+$.
23. $\frac{4}{9} = .4444+$.
24. $\frac{3}{11} = .2727+$.
25. $\frac{9}{14} = .6428+$.
26. $\frac{29}{48} = .604166+$.
27. $\frac{4}{73} = .5466+$.
28. $75\frac{3}{5} = 75.6$.
29. $136\frac{7}{8} = 136.875$.
30. $261\frac{17}{25} = 261.68$.
31. $346\frac{11}{13} = 346.8133+$.
32. $465\frac{1}{400} = 465.0025$.
33. $523\frac{1}{256} = 523.00390625$.
34. $740\frac{11}{800} = 740.01375$.
35. $956\frac{5}{640} = 956.0078125$.

## ADDITION OF DECIMALS.

*Page 147.*

1, 2. Given.
3. 881.6217.
4. 139.26168.
5. 14.38916.
6. 118.792.
7. 892.688.
8. 2.76231.
9. 92.00537.
10. 37.417.
11.

·7
·312
·46
·9
·0228

2.3948 *Ans.*

12.
.0023
.00023
.023
.23
23.00
23.25553 *Ans.*

13.
575.7
.0259
.000005
.00320
575.729105 *Ans.*

14.
17.6
8.5
10.25
16.75
53.10 bushels. *Ans.*

15.
7.5
11.37
10.6
25.125
21.375
75.970 pounds. *Ans.*

## SUBTRACTION OF DECIMALS.

*Page 148.*

1. Given.
2. 7.831.
3. 6.60249.
4. 17.3675.
5. 17.94794.

*Page 149.*

6. 7.831.
7. 6.60249.
8. 17.3675.
9. 77.94794.
10. 78.569966.
11. 2.896216.
12. .8969755.
13. .5496933.
14. .876543211.
15. .01235679.
16. .099.
17. .00999.

18.
100.000
.001
99.999 *Ans.*

19.
45.0000
.0045
44.9955 *Ans.*

20.
.000100
.000002
.000098 *Ans.*

21. $443.825.

22. Father's land, 504.03 acres.
1st son, 100.45
2d " 263.75 364.20, both.
*Ans.* Left, 139.83 acres.

23. 99.063. *Ans.*

24. 1st traveled, 571.37 miles.
2d " 501.037 "
Difference, = 70.333 miles.
Sum, = 1072.407 "

## MULTIPLICATION OF DECIMALS.

*Page 150.*

1, 2. Given.

3. .14530.

4. .07213
.0021
7213
14426
.000151473 *Ans.*

5. .000456
.0037
3192
1368
.0000016872 *Ans.*

6. 4360.12
5.000
21800.6 *Ans.*

7. 4.0005
.00301
40005
120015
.012041505 *Ans*

8. 5.0206
4.0007
351442
200824
20.08591442

9. 3.0004
106
180024
30004
318.0424 *Ans*

10. 7.2136
100
721.36 *Ans*

11. .0048
.0091
48
432
.00004368 *Ans.*

12. 15.004
.10009
135036
15004
1.50175036 *Ans.*

13. 6.0103
.00012
.00072 1236 *Ans.*

14. 20007
.000001
.020007 *Ans.*

15. 17.25 p.
25
8625
3450
*Ans.* 431.25 pounds.

16. $10.875
20.5
54375
21750
$222.9375 *Ans.*

17. 750.5 bu.
.625
37525
15010
45030
*Ans.* 469.0625 bu.

18. $200.75
53
60225
100375
$10639.75 *Ans.*

19. .28
.045
140
112
.01260 *Ans.*

20. $9.375
73.25
46875
18750
28125
65625
$686.71875 *Ans.*

*Page 151.*

21. .5
.005
.0025 *Ans.*

22. .02
.0002
.000004 *Ans.*

23. .07
.000007
.00000049 *Ans.*

24. .201
.000003
.000,000,603 *Ans.*

25. .00005
.006
.00,000,030 *Ans.*

26. .000004
.063
.000,000,252 *Ans.*

27. 100.
.00001
.00100 *Ans.*

28. 1000000
.000001
1.000000 *Ans.*

29. .000001
.000000001
.000,000,000,000,001

30. Given.

31. 3205.05.

32. 8003.56.

33. 2.43.

34. 5.8.

35. 5.

36. $50.

37. $600.

38. 4.25 bu.
6.5
2125
2550
*Ans.* 27.625 bu.

39. 3.75 m.
17.5
1875
2625
375
*Ans.* 65.625 m.

## DIVISION OF DECIMALS.

*Page 153.*

1. Given.

2. NOTE.—In division of decimals, it is advisable for beginners to reduce the divisor and dividend to a *common denominator*, as directed by the first method. This is not only the simplest, but the only way by which the majority of learners can be led to an understanding of the reasons for pointing off the quotient.

9.000).063000
0.007 *Ans.*

3. .214).856(4 *Ans.*
856

4. 1.07)642.00(600 *Ans.*
642
0000

***Page 153—Continued.***

5. 11.00)4.5700
*Ans.* 0.4154+

6. 2.6)78.4(30.153+ *Ans.*
78
40
26
140
130
100
78

7. 3.50)8.45(2.4142+ *Ans.*
7 00
1 450
1 400
500
350
1500
1400
1000
700

8. 9.700)1.262(.13+ *Ans.*
9700
29200
29100

9. .6500).46250(.7115+
45500
7500
6500
10000
6500
35000
32500
2500 rem.

10. 100.00)97.68(.9768
90000
76800
70000
68000
60000
80000
80000

11. .00675.

12. .0000576.

13. 3020)45.30(.015 *Ans.*
3020
15100
15100

14. .00096).03753
625.5 *Ans.*

15. 1.2)12.0(10. *Ans.*

16. .12)1.20
10 *Ans.*

17. 12).12
.01 *Ans.*

18. 5).000010
.000002 *Ans.*

19. .1).00005
.0005 *Ans.*

20. .000006).000300
50 *Ans.*

21. 1000000.00).2700000000
*Ans.* 0.00000027

22. 2.25)103.50(46 coats.
900
1350
1350

23. 16.5 ft.)732.75(44.409+r.
660
727
660
675
660
1500
1485
15 rem.

24. $18.75)$506.25(27 stoves.
3750
13125
13125

25. Given.

26. 4.3753.

27. .063845.

28. .0000253.

29. .0000005.

30. $.0005.

31. $.0475.

# UNITED STATES MONEY.

*Page 155.*

1. $40.40.
2. $5.055.
3. $50.603.
4. $100.075.
5. $2001.085.
6. $705.01.
7. $84.125.
8. $.055, $.0625, $.1175.

*Page 156.*

9. $7.3125.
10. $19.3125.
11. $140.80.
12. $55.055.

## REDUCTION OF UNITED STATES MONEY.

*Case I. Page 157.*

1, 2. Given.
2. 13500 cents.
3. 368000 mills.
4. 100000 mills.
5. 168000 cents.
6. 970 mills.
7. 35625 cents.
8. 780375 mills.
9. 800600 mills.

*Case II. Page 157.*

1. Given.
2. $16.25.

3. $8.126.
4. $10.000.
5. 926.5 cents.
6. $895.67.
7. $94.283.
8. 8560 cents.
9. $263.475.
10. $7.63.
11. 500 × 2 = 1000 cents;
1000 cents = $10. *Ans.*
12. 675 × 1000 = 675000 m.;
675000 m. = $675. *Ans.*

## ADDITION OF UNITED STATES MONEY.

***Page 158.***

1. Given.

2.
$13.62½
25.25
9.75
$48.62½ *Ans.*

3. $780.25.

4.
$97.87½
82.09
20.12½
$200.09 *Ans.*

5. $224.53.
6. $761.4785.
7. $17.28.

8.
$68.005
.875
.3125
$69.1925 *Ans.*

9. $13131.72.

***Page 159.***

10. $54.50.

11.
$17.50
30.18¾
21.06¼
51.73
$120.48

12. $76.82.

## SUBTRACTION OF UNITED STATES MONEY.

1. Given.
2. $533.105.
3. $604.625.
4. $524.50.
5. $585.25.

***Page 160.***

6. $948.33.
7. $171.9625.
8. $411.075.
9. $0.955.

10. $7.50
.0725. $7.4275. *Ans.*

11. $494.945.

12. Cash, $100.00
Am't of goods, 71.25
Charge = $28.75

## MULTIPLICATION OF UNITED STATES MONEY.

*Page 160.*

1. Given.

2. $11.50
65
5750
6900
$747.50 *Ans.*

3. 145.3
1.08
11624
1453
$1569.24 *Ans.*

4. $3.875
75
19375
27125
$290.625

5. $0.955 *Ans.*
63
2865
5730
$60.165 *Ans.*

6. $4.175
110
$459.250 *Ans.*

*Page 161.*

7. $51.75
1.95
25875
46575
5175
$100.9125 *Ans.*

8. $6.075
2.325
30375
12150
18225
12150
$14.124375 *Ans.*

9. $10.05
6.75
5025
7035
6035
$67.8375 *Ans.*

**Page 181—Continued.**

10. [illegible] Ans.

11. [illegible] Ans.

12. [illegible] Ans.

13. $.005 × 1000 = $5.000 Ans.

14. $1.011 × .001 = $0.001011 Ans.

15. $0.1875 × 35 = $6.5625 Ans.

16. $1.155 × 51 = 1155, 5775 = $58.905 Ans.

17. $.375 × 152 = 15 [illegible], 375 = $[illegible] Ans.

18. $.3125 × 144 = 12500, 12500, 3125 = $45.0000 Ans.

19. 16.5 p. × 13 = 214.5 p.
-375
10725
15015
6435
$80.4375

20. 12 p. × 35 y. = 420 y.
4.50
$1890.00 Ans.

21. 55 p. × 21 = 1155 p.
-475
5775
8085
4620
$548.625 Ans.

22. $3.25 × 55 = 1625 + 1625 = $178.75 *Ans.*

23. $32 × 37 = 1184 + 12 = $14208 *Ans.*

## DIVISION OF UNITED STATES MONEY.

*Page 162.*

1. Given.

2. 63)$123.75($1.964+.

3. 165)$8.25($0.05. *Ans.* 825

4. 310)$852.50($2.75. *Ans.*

5. 356)$1040.00($2.921+.

6. $0.175)$17.500 — 100 *Ans.*

7. $1.01)$365.07 — 361.455+. *Ans.*

8. $.25)$1000.00 — 4000 *Ans.*

9. $25)$0.25 — .01 *Ans.*

10. $0.05)$0.005 — .1 *Ans.*

11. $1.01)$101.001 — 100 *Ans.*

12. $0.05)$500.00 — 10000 *Ans.*

13. $0.002)$1200.000 — 600000 *Ans.*

14. 410)$1216 — $2.965+ *Ans.*

15. $9.25)$8560.00 — 925.405+t.

1st prod. 8325, 2d div. 2350
2d " 1850, 3d " 5000
3d " 4625, 4th " 3750
4th " 3700, Rem. 5000

16. $120.35)$35267.28(293.039+ tons. *Ans.*

1st prod. 24070, 2d div. 111972
2d " 108315, 3d " 36578
3d " 36105, 4th " 47300
4th " 36105, 5th " 111950
5th " 108315, Rem. 3635

17. 2516)$157.25

$0.0625 *Ans.*

1st p. 15096, 2d d. 6290
2d " 5032, 3d " 12580
3d " 12580, Rem. 0

18. 5000)$273.58

$0.0547+ *Ans.*

1st p. 25000, 2d d. 23580
2d " 20000, 3d " 35800
3d " 35000, Rem. 800

# COUNTING-ROOM EXERCISES.

## *Page 163.*

| | | | | | |
|---|---|---|---|---|---|
| 1. | $56392.73 | debits. | 2. | $512063.49 | credits. |
| | $42434.35 | credits. | | $352206.33 | debits. |
| Bal. | $13958.38 | debit. | Bal. | $159857.16 | credit. |

## *Page 165.*

1. Given.

| | | | | |
|---|---|---|---|---|
| 2. | 28 yards silk, | @ | $3.50 = | $98.00 |
| | 35 yards table linen, | @ | $2.12½ = | 74.37½ |
| | 6 pair gloves, | @ | $1 75 = | 10.50 |
| | 43½ yards muslin, | @ | $0.33 = | 14.35½ |
| | 1 doz. pair cotton hose, | @ | $0.80 = | 9.60 |
| | *Amount,* | | | $206.83 |

| | | | | |
|---|---|---|---|---|
| 3. | 75 bbls. pork, | @ | $25.00 = | $1875.00 |
| | 160 bbls. flour, | @ | $8.75 = | 1400.00 |
| | 500 gals. molasses, | @ | $0.93 = | 465.00 |
| | 75 boxes raisins, | @ | $5.37½ = | 403.125 |
| | 256 gals. kerosene, | @ | $0.87½ = | 224.00 |
| | *Amount,* | | | $4367.125 |

| | | | | |
|---|---|---|---|---|
| 4. | 319 yds. broadcloth, | @ | $5.87½ = | $1874.12½ |
| | 416 yds. cassimere, | @ | $2.10 = | 873.60 |
| | 1110 yds. muslin, | @ | $0.28 = | 310.80 |
| | 265 yds. ticking, | @ | $0.47 = | 124.55 |
| | *Amount,* | | | $3183.07½ |

## *Page 166.*

5.

NEW HAVEN, *May 16th*, 1867.

JAMES BREWSTER,

*Bought of* HORACE FOOTE & CO.

| | | | |
|---|---|---|---|
| 175 lbs. sugar, | @ $0.17 | $29.75 | |
| 5 gals. molasses, | @ $0.63 | 3.15 | |
| 3 boxes raisins, | @ $6.50 | 19.50 | |
| 15 lbs. tea, | @ $1.25 | 18.75 | $71.15 |

*Received Payment,*

HORACE FOOTE & CO.

6.

CINCINNATI, *June 3d*, 1867.

GEORGE BLISS & CO.,

*Bought of* JAMES HENRY.

| | | | |
|---|---|---|---|
| 1625 bu. wheat, | @ $1.95 | $3168.75 | |
| 130 bbls. flour, | @ $11.00 | 1430.00 | |
| 265 lbs. tobacco, | @ $0.48 | 127.20 | |
| 1730 lbs. cotton, | @ $0.27½ | 475.75 | $5201.70 |

*Received Payment,*

7.

RICHMOND, *July 15th*, 1867.

HENRY RUTLEDGE, ESQ.,

*To* PINKNEY & BROTHER, *Dr.*

| | | | |
|---|---|---|---|
| To 1 shawl, | @ $450.00 | $450.00 | |
| " 19 yds. silk, | @ $3.63 | 68.97 | |
| " 16 yds. point lace, | @ $11.00 | 176.00 | |
| " 6 pair gloves, | @ $2.05 | 12.30 | |
| " 12 pair hose, | @ $0.87½ | 10.50 | $717.77 |

*Received Payment,*

8.

| | | | |
|---|---|---|---|
| 37 Greek Readers, | @ $1.85 | $68.45 | |
| 60 " Grammars, | @ $1.45 | 87.00 | |
| 75 Latin " | @ $1.38 | 103.50 | |
| 25 Virgils, | @ $3.62 | 90.50 | |
| 14 Iliad, | @ $3.28 | 45.92 | $395.37 |

## BY ALIQUOT PARTS OF $1.

| | |
|---|---|
| 6. $100 \div 8 = \$12\frac{1}{2}$. | 1. |
| 7. $750 \div 5 = \$150$. | 2. |
| 8. $1250 \div 6 = \$208\frac{1}{3}$. | 4. |
| 9. $1745 \div 3 = \$581\frac{2}{3}$. | 4. |
| 10. $375 \div 12 = \$31\frac{1}{4}$. | 8. |

11. $1167 \div 4 = \$291\frac{3}{4}$.
12. $175 \div 5 = \$35$.
13. $219 \div 8 = \$27\frac{3}{8}$.
14. $645 \div 6 = \$107\frac{1}{2}$.
15. $347 \div 3 = \$115\frac{2}{3}$.

### *Page 169.*

16. Given.

17. 4)168, cost at $1.
42 " " $\frac{1}{4}$.
*Ans.* $210 " " $1\frac{1}{4}$.

18. 2)$365, cost at $1.
$182\frac{1}{2}$ " " $\frac{1}{2}$.
*Ans.* $547\frac{1}{2}$ " " $1\frac{1}{2}$.

19. 8)$512, cost at $1.
64 " " $\frac{1}{8}$.
*Ans.* $576 " " $1\frac{1}{8}$.

20. 6)$144, cost 12 d., at $1.
24 " " " $\frac{1}{6}$.
*Ans.* $168 " " " $1\frac{1}{6}$.

21. 5)$200, cost at $1.
40 " " $\frac{1}{5}$.
*Ans.* $240 " " $1\frac{1}{5}$.

22. Given.
23. $\$6.83 \div \frac{1}{2} = 13.66$ yds.
24. $\$375 \div \frac{1}{3} = 1125$ lbs.
25. $\$450 \div \frac{1}{4} = 1800$ coc'nuts.
26. $\$538 \div \frac{1}{5} = 2690$ p.

### *Page 170.*

1. Given.

2. $4532 \times \$17 = \$77044.00$
$4532 \times \frac{1}{4} = 1133.00$
Div. by 1000 = $\$78.17700$

3. $1925 \times \$12 = \$23100.00$
$1925 \times \frac{1}{8} = 962.50$
Div. by 100 = $\$240.6250$

4. $25268 \times \$31 = \$783308.00$
$25268 \times \frac{1}{4} = 6317.00$
Div. by 1000 = $\$789.62500$

5. $20345 \times \$5 = \$101725.00$
$20345 \times \frac{3}{4} = 15258.75$
Div. by 100 = $\$1169.8375$

6. $19263 \times \$6\frac{1}{4} = \$1203.9375$.

7. $10250 \times \$3.95 = \$40487.50$
$\$40487.50 \div 1000 =$
$\$40.4875$. *Ans.*

8. $1275.00, cost at $1.
956.25 " " $\frac{3}{4}$.
100)2231.25 " " $1\frac{3}{4}$.
$22.3125 " " $1\frac{3}{4}$ p. C.

9.
$13456 \times \$7.45 = \$100247.20$.
$\$100247.20 \div 1000 =$
$\$100.2472$. *Ans.*

10. $82 \times \$5\frac{1}{2} = 451$;
$451 \div 100 = \$4.51$. *Ans.*

11. $93 \times \$15 = \$1395.00$
$93 \times \frac{1}{4} = 23.25$
Div. by 100 = $\$14.1825$

12. $355 \times \$45 = \$15975$.
$\$15975 \div 1000 = \$15.975$.

## BUSINESS METHODS.

*Page 167.*

1–3. Given.
4. $789.25.
5. $4312.50.
6. $43.75.
7. $892.50.
8. $84.00 ÷ 252 = $0.33⅓.
9. $46.06 ÷ 8.75 = $5.264.
10. $1449 ÷ 46 = $31.50.
11. $561 ÷ $5.50 = 102 B.
12. $1262.25 ÷ $8.50 = 148½ vests.
13. 5 × 6¼ = 31¼ cts. a day; 365 × $.31¼ = $114.06¼ a year.
14. 18 yds., @ $2.12½ = $38.25
14 " @ .63 = 8.82
12 " @ .06¼ = .75
*Amount* = $47.82
15. $11350 × 265 = $3007750
16. $321.675 ÷ $0.34 = 946.1 + pounds.
17. $1579.40 ÷ $0.20 = 7897 lbs. sold.
7897 lbs. ÷ 53 = 149 lbs. average.
18. 45 yds. × 3 = 135 yds.; 135 × 40½ cts. = $54.675; $54.675 ÷ $1.50 = 36.45 bushels. *Ans.*

*Page 168.*

19. $9.50 — $4.75 = $4.75 a w.
$4.75 × 52 = $247. *Ans.*
20. 3 × 10 = 30 c. for liquor.
5 × 6 = 30 c. " cigars.
.60 per day.
$.60 × 365 × 35 = $7665.00.
$7665.00 ÷ $1.25 = 6132 a.
21. 175 × $6.375 = $1115.625
minus 637.50
Lost $478.125

## BY ALIQUOT PARTS OF $1.

1. Given.
2. 265 ÷ 4 = $66¼.
3. 195 ÷ 3 = $65.
4. 352 ÷ 16 = $22.
5. 819 ÷ 2 = $409½.
6. 100 ÷ 8 = $12½.
7. 750 ÷ 5 = $150.
8. 1250 ÷ 6 = $208⅓.
9. 1745 ÷ 3 = $581⅓.
10. 375 ÷ 12 = $31¼.

11. $1167 \div 4 = \$291\frac{3}{4}$.
12. $175 \div 5 = \$35$.
13. $219 \div 8 = \$27\frac{3}{8}$.
14. $645 \div 6 = \$107\frac{1}{2}$.
15. $347 \div 3 = \$115\frac{2}{3}$.

### *Page 169.*

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17. 4)168, cost at $1.
42 " " $\$\frac{1}{4}$.
*Ans.* $210 " " $\$1\frac{1}{4}$.

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$182\frac{1}{2}$ " " $\$\frac{1}{2}$.
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19. 8)$512, cost at $1.
64 " " $\$\frac{1}{8}$.
*Ans.* $576 " " $\$1\frac{1}{8}$.

20. 6)$144, cost 12 d., at $1.
24 " " " $\$\frac{1}{6}$.
*Ans.* $168 " " " $\$1\frac{1}{6}$.

21. 5)$200, cost at $1.
40 " " $\$\frac{1}{5}$.
*Ans.* $240 " " $\$1\frac{1}{5}$.

22. Given.
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7. $10250 \times \$3.95 = \$40487.50$
$\$40487.50 \div 1000 =$
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$13456 \times \$7.45 = \$100247.20$.
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$\$100.2472$. *Ans.*

10. $82 \times \$5\frac{1}{2} = 451$;
$451 \div 100 = \$4.51$. *Ans.*

11. $93 \times \$15 = \$1395.00$
$93 \times \frac{1}{4} = 23.25$
Div. by 100 = $\$14.1825$

12. $355 \times \$45 = \$15975$.
$\$15975 \div 1000 = \$15.975$.

### *Page 192—Continued.*

31. NOTE.—This example has this peculiarity: The sum of the lower denominations is equal to a unit of the highest; and yet the value of each of these terms is less than that of the next higher.

Thus, 1 ft. + 6 in. = $\frac{1}{2}$ yd.;
$\frac{1}{2}$ yd. + 5 yds. = $5\frac{1}{2}$ yds., or 1 r.;
1 r. + 39 r. = 40 r., or 1 fur.;
1 fur. + 7 fur. = 8 fur., or 1 m. Hence,
1 m. + 7 fur. + 39 r. + 5 yds. + 1 ft. + 6 in. = 2 m. 126720 in. *Ans.*

PROOF.—126720 in. = 2 miles.

The denominations given may be obtained thus:

2 miles = 1 m. + 1 m.

Now 1 m. = 7 fur. + 1 fur.; 1 fur. = 39 r. + 1 r.; 1 r. = 5 yd. + $\frac{1}{2}$ yd.; $\frac{1}{2}$ yd. = 1 ft. 6 in.

Hence, 126720 in. = 1 m. 7 fur. 39 r. 5 yd., 1 ft. 6 in.

32. $2\frac{1}{2}$ m. × 320 = 800 r.
\$1.85 × 800 = \$1480.

33. 8299.2 × 3 = 24897.6 m.
24897.6 × \$0.06$\frac{1}{4}$ = \$1556.10. *Ans.*

34. 57 yds. × 8 = 456 eighths.

35. 163 yds. × 16 = 2608 sixteenths.

36. 578 fourths ÷ 4 = $144\frac{1}{2}$ y.

37. 1978 sixteenths ÷ 16 = $123\frac{5}{8}$ yds.

38. $16\frac{1}{2}$ yds. = $\frac{66}{4}$ yds.
$\frac{66}{4} \div \frac{3}{4}$ = 22 vests. *Ans.*

39. $18\frac{3}{4} = \frac{150}{8}$ yd.
$\frac{150}{8} \div \frac{1}{8}$ = 150 badges.
150 × \$.12$\frac{1}{2}$ = \$18.75.
\$18.75 − \$2.50 = \$16.25 p.

40. $272\frac{1}{4}$) 43816 sq. ft.
4 4
1089 )175264 fourths.
160 sq. r., $\frac{1024}{4}$
160 sq. r. 256 sq. ft. *Ans.*

41. $30\frac{1}{4}$) 25430 sq. yd.
4 4
121 )101720 fourths sq. yd.
160)840 sq. r. $\frac{80}{4}$, or 20 sq. yds.
*Ans.* 5 A. 40 sq. r. 20 sq. yds.

42. 160 A. 25 sq. r. 8 sq. ft.
160
25625 sq. r.
272¼
6976414¼ sq. ft. *Ans.*

43. 100 sq. m. × 640 = 64000 acres.
64000 × 160 = 10240000 sq. rods. *Ans.*

44. 64 A. 8 sq. r. = 10248 sq. r.
10248 ÷ 6 = 1708 sq. r.
1708 sq. r. ÷ 160 =
10 A. 108 sq. r. *Ans.*

45. 15¼ A. or 2440 sq. r. ÷ 20 = 122 lots.
122 × $250 = $30500, s. pr.
15¼ × $500 = $7625, c.
Profit, $22875

46. 85 cu. y. 10 cu. ft.
27
2305 cu. ft.
1728
3983040 cu. in. *Ans.*

47. 250 c. × 128 = 32000 c. ft.

48. 1728)18265 cu. in.
*Ans.* 10 c. ft. 985 c. in.

49. 128)8278
*Ans.* 64 c. 86 cu. ft.

50. 5259 qts. *Ans.*

51. 24051 pts. *Ans.*

***Page 193.***

52. 6641 bu. *Ans.*

53. 254 bu. 2 pks. 3 qts.

54. 75 bu. 3 pks. = 2424 qts.
2424 × $0.17 = $412.08.

55. 2 bu. 1 pk. 3 qts. = 150 pts.
150 × $0.08½ = $12.75.

56. 98 qts. 1 pt. 2 gi. = 790 gi.

57. 150 gal. 3 qts. = 603 qts.

58. 45 bar. 10 gals. 3 qts. = 5713 qts. *Ans.*

59. 17 hhds. 10 gals. 3 qts.
63
1081 gals. × 4 = 4327 qts.
4327 × 2 = 8654 pts.
8654 × 4 = 34616 gills.

60. 2)86673 pts.
4)43336 qts. 1 pt.
10834 gals. 1 pt. *Ans.*

61. 31½ gals. = 504 half pts.
504 ÷ 3 = 168 bottles.

62. 63 gals. = 2016 gills.
2016 × $0.06¼ = $126.

63. 30 d. 5 h. 42 m. 10 s.
24
725 × 60 = 43542 m.
43542 × 60 = 2612530 sec.

64. 17 w. 3 d. 5 h. 30 m. =
122 days. = 2933 hrs. =
176010 minutes. *Ans.*

65. 365 d. 5 h. 48 m. 49.7 s.
=8765 h.; 8765 h. × 60
=525948 m.; 525948 ×
60=31556929.7 s. *Ans.*

66. 60)6034500 sec.
60)100575 min.
24)1676 h. 15 m.
7)69 d. 20 h.
9 wk. 6 d.
9 wk. 6 d. 20 h. 15 m. *A.*

67. 24)5603045 hrs.
365)233460 d. 5 hrs.
639 yrs. 225 d.
*Ans.* 639 yrs. 225 d. 5 hrs.

68. 60)10250300 min.
24)170838 hrs. 20 m.
366)7118 d. 6 hrs.
19 yrs. 164 d.
19 y. 164 d. 6 h. 20 m. *A.*

69. 27 d. × 10½=283½ hrs.
283½ × $0.75=$212.625.

70. 60)48561″
60)809′ 21″
*Ans.* 13° 29′ 21″

71. 60)65237′
30)1087° 17′
*Ans.* 36 s. 7° 17′

72. 237° 40′ 31″
60
14260′ × 60=855631″.

73. 360° × 60=21600′;
21600′ × 60=1296000″.

74. 1965 ÷ 12=163¾ doz.

75. 125 × 12=1500 eggs.

76. 100000 ÷ 12=8333⅓ doz.
8333⅓ ÷ 12=694⅘ gross.

77. 65 g. × 12=780 doz.;
780 doz. × 12=9360 p.

78. 3 score or 60 + 7=67 lbs.

79. 75 × 24=1800 sheets.

80. 10000 ÷ 24=416⅔ quires.

## APPLICATIONS OF WEIGHTS AND MEASURES.

### *Page 194.*

1. Given.

2. 40 × 31=1240 sq. r.
1240 ÷ 160=7 A. 120 sq. r.
or 7¾ acres. *Ans.*

3. ¼ A.=¼ of 160=40 sq. r.;
40 × 272¼=10890 sq. ft.
10890 sq. ft. ÷ 66=165 ft.

### *Page 195.*

4. 15 A. × 160=2400 sq. r.
33⅓)2400 sq. r.
72 rods. *Ans.*

5. $50 × 30=$1500, cost.
30 A.=4800 sq. r.
5 × 4=20 sq. r., size 1 lot.
4800 ÷ 20=240 lots.
$200 × 240=$48000, rec'd
$48000 − $1500=$46500, pr.

6. $230 \times 6 = 1380$ sq. ft. = 1 side;
$1380 \times 2 = 2760$ sq. ft. = 2 sides;
$125 - 12 = 113$, the width;
$113 \times 6 = 678$ sq. ft., 1 end;
678 sq. ft. $\times 2 = 1356$ s. ft., = 2 ends.
$2760 + 1356 = 4116$ sq. ft.

7. $2 \times 2 = 4$ sq. ft.;
$1 \times 2 = 2$ sq. ft.
4 sq. ft. $-$ 2 sq. ft. = 2 sq. ft. *Ans.*

8. 3 A. = 480 square rods;
$480 \times 2\frac{1}{2} = 1200$ bu.
$\$.25 \times 1200 = \$300$. *Ans.*

9. Given.

10. $12 \times 4 = 48$ s. ft.; 48 s. ft. $\times 144 = 6912$ sq. in.;
$6 \times 6 = 36$ sq. in. to each bulb.
$6912 \div 36 = 192$ bulbs.

11. $\frac{3}{4}$ A. = 32670 sq. ft.
$3 \times 3 = 9)\underline{32670}$ sq. ft.
3630 vines.
$\$5.25 \times 3630 = \$190.575$.

12. $33 \times 33 = 1089$ sq. ft. to 1 tree;
$1089 \times 100 = 108900$ s. ft.
108900 sq. ft. $= 2\frac{1}{2}$ A.
Or, 33 ft. = 2 rods. Now
$2 \times 2 = 4$ sq. rods;
4 sq. r. $\times 100 = 400$ sq. r. = 2 A. 80 r. *Ans.*

***Page 196.***

13. Given.

14. 60 ft. = 20 yds.;
45 ft. = 15 yds.;
$20 \times 15 = 300$ sq. yds.
$\$1.08 \times 300 = \$324.00$.

15. 18 ft. 6 in. $= 18\frac{1}{2}$ ft. $\times 15 = 277\frac{1}{2}$ sq. ft.
$277.5 \times \$3.20 = \$8.88$.

16. $206 \times 9\frac{1}{2} = 1957$ sq. ft. = $217\frac{4}{9}$ sq. yds.
$217\frac{4}{9} \times \$1.85 = \$402.27\frac{7}{9}$.

17. $60 \times 25 = 1500$ sq. ft.
$1500 \times \$1.50 = \$22.50$.

18. $65 \times 25 = 1625$ sq. ft. = $180\frac{5}{9}$ sq. yds.
$180\frac{5}{9}$ sq. yds. $\times \$0.25 = \$45.13\frac{8}{9}$. *Ans.*

***Page 197.***

19, 20. Given.

21. 14 ft. $\times 1\frac{1}{3}$ ft. $= 18\frac{2}{3}$ b. ft.
$18\frac{2}{3} \times 7\frac{1}{2}$ cts. $= \$1.40$, val.

22. 15 ft. $\times \frac{8}{6}$ ft. $= 12\frac{1}{2}$ b. ft.

23. $14 \times 1\frac{1}{6} = 16\frac{1}{3} \times 9 =$ 147 ft. *Ans.*

24. $45 \times 20 \times 2 = 1800$ sq. ft. or 18 squares;
$18 \times 1000 = 18000$ shingles or 18 M.
$\$15.45 \times 18\text{M.} = \$278.10$.

25–27. Given.

***Page 198.***

28. A piece of studding 3 by 4 in. is equivalent to a board 1 ft. wide and 1 in. thick. Hence, in finding its contents, we may consider the length as so many board feet.

$45 \times 11 = 495$ board feet.
$495 \times \$.03 = \$14.85$. *Ans.*
Or, 11 ft. $\times$ 1 ft. (3 $\times$ 4 in.) $= 11$ b. ft.
11 b. ft. $\times \$.03 = \$.33$;
$\$.33 \times 45 = \$14.85$. *Ans.*
Again, 11 ft. $\times \frac{1}{4}$ ft. (3 in.) $\times 4 = 11$ ft.
$11 \times 45 = 495$ b. ft.;
$495 \times .03 = \$14.85$. *Ans.*

29. $32 \times 1\frac{1}{2} \times 1\frac{1}{12} = 52$ cu. ft.
$\$.45 \times 52 = \$23.40$. *Ans.*

30. $8 \times 4 \times 5 = 160$ cu. ft.;
$160 \div 128 = 1\frac{1}{4}$ cords.
$\$3\frac{1}{2} \times 1\frac{1}{4} = \$4\frac{3}{8}$. *Ans.*

31. Given.

***Page 199.***

32. 10 ft. $\div 4 = 2\frac{1}{2}$ ft.
$2\frac{1}{2} \times 2\frac{1}{2} = 6.25$;
$6.25 \times 60 = 375$ cu. ft.
$375 \div 128 = 2\frac{119}{128}$ cords.

33. $22 \times 20 \times 15 = 6600$ c. ft.
$6600 \div 400 = 16\frac{1}{2}$ tons.

34. $30 \times 12 \times 10 = 3600$ c. ft.;
$3600 \div 500 = 7\frac{1}{5}$ tons.
$\$18.50 \times 7\frac{1}{5} = \$133.20$.

35. $45 \times 24 \times 8 = 8640$ cu. ft.
$= 320$ cu. yds.
$\$0.35 \times 320 = \$112$.

36. $1\frac{1}{2}$ ft. $\times 8 \times 45 \times 2 = 1080$ cu. ft. in both sides.
$1\frac{1}{2} \times 8 \times 22 \times 2 = 528$ cu. ft. " " ends.
The four walls $= 1608$ cu. ft.
$1608 \div 25 = 64.32$ perches.
$\$5.25 \times 64.32 = \$337.68$. *Ans.*

37. 50 ft. $\times$ 21 ft. $\times$ 1 ft. $= 1050$ cu. ft., 1 side.
35 ft. $\times$ 21 ft. $\times$ 1 ft. $= 735$ cu. ft., 1 end.
Half the building $= 1785$ cu. ft.
Multiplying by 2
Building $= 3570$ cu. ft.
Minus $\frac{1}{10}$, 357
$3213$ cu. ft.
8 in. $\times 4 \times 2 = 64$ cu. in., size of 1 brick.
64 cu. in. $= \frac{1}{27}$ cu. ft.
3213 cu. ft. $\div \frac{1}{27}$ cu. ft. $= 86751$ bricks. *Ans.*

38. $800 \times 60 \times 4\frac{1}{2} = 216000$ cu. ft.
$216000 \div 27 = 8000$ cu.y.
$\$.45 \times 8000 = \$3600$.

### *Page 200.*

39. Given.

40. 21 ft. $\times$ 18 ft. $= 378$ sq. ft. or 42 sq. yds.
42 sq. yds. $\div \frac{3}{4}$ sq. yds. $=$ 56 yds. *Ans.*
Or, 21 ft. $= 7$ yds. and 18 ft. $= 6$ yds.
7 yds. $\times$ 6 yds. $= 42$ sq. y.
$\frac{3}{4}$ yd. $\times$ 1 $= \frac{3}{4}$ sq. yd.
42 sq. yds. $\times \frac{4}{3} = \frac{168}{3} = 56$ yds. *Ans.*

41. 16 yds. $\times 3\frac{1}{2}$ yds. $= 56$ sq. yds.
$56 \div 1\frac{1}{4} = 56 \times \frac{4}{5} = \frac{224}{5} =$
$44\frac{4}{5}$ yds. *Ans.*

42. 15 yds. $\times \frac{3}{4}$ yd. $= \frac{45}{4}$, or $11\frac{1}{4}$ sq. yds.
$11\frac{1}{4} = \frac{90}{8} \div \frac{7}{8} = 12\frac{6}{7}$ yds.
Or, $\frac{45}{4} \times \frac{8}{7} = \frac{90}{7}$,
or $12\frac{6}{7}$ yds. *Ans.*

43. $25 \times 20 = 500$ sq. ft.
15 in. $= 1\frac{1}{4}$ ft.; $1\frac{1}{4}$ ft. $\times$ $1\frac{1}{4} = \frac{25}{16}$ sq. ft.
$500 \div \frac{25}{16} = \frac{8000}{25}$, or 320 sods. *Ans.*
Or, $\frac{500}{1} \times \frac{16}{25} = 320$ s.

44. 10 yds. $\times 1\frac{1}{2}$ yd. $= 15$ sq. y.
$15 \times 2 = 30$ sq. yds.
$30 \div \frac{5}{8} = \frac{240}{5} = 48$ yds.

45. 48 ft. $\times 7\frac{1}{2}$ ft. $= 360$ sq. ft.
9 in. $= \frac{3}{4}$ ft.; $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$ sq. ft.
$\frac{360}{1} \times \frac{16}{9} = 640$ tiles.

46. $18 \times 9 \times 2 = 324$ sq. ft.
$16 \times 9 \times 2 = 288$ sq. ft.
The 4 sides $= 612$ sq. ft.
$612 - 81 = 531$ sq. ft. covered.
9 yds. or 27 ft. $\times 1\frac{1}{2} =$
$40\frac{1}{2}$ sq. ft. in 1 roll.
$531 \div 40\frac{1}{2} = 13\frac{1}{9}$ rolls.

47. 8 ft. $\times$ 6 ft. $\times$ 5 ft. $= 240$ cu. ft.
240 cu. ft. $= 414720$ c. in.
$414720 \div 231 = 1795\frac{25}{77}$ gals. *Ans.*

### *Page 201.*

48. 20 hhds. $= 1260$ gals.
$1260 \times 231 = 291060$ c.in.
$6 \times 6 = 36$ sq. ft. $= 5184$ sq. in.
$291060 \div 5184 = 56\frac{7}{48}$ in.

49. $6 \times 4 \times 3 = 72$ cu. ft.
$72 \times 1728 = 124416$ c. in.
$124416 \div 2150.4 =$
$57.857+$ bu. *Ans.*

50. $50 \times 63 = 3150$ gallons.
$3150 \times 231 = 727650$ c. in.
$727650 \div 1728 = 421\frac{3}{32}$ c. ft.

51. $5 \times 3 = 15$ sq. ft. $= 2160$ sq. in.
10 bu. $\times 2150.4 = 21504$ cu. in.
$21504 \div 2160 = 9.955\frac{5}{9}$ in.

52. $5 \times 4 \times 3 = 60$ cu. ft.
$60 \times 1000 = 60000$ oz. $=$ 3750 lbs. *Ans.*

55. 12 lbs. 6 oz. Av. $= 198$ oz.
$198 \times 437\frac{1}{2} = 86625$ grs.
$86625 \div 480 = 180\frac{145}{32}$ oz. Troy.
$180\frac{145}{32} - 40 = 140\frac{145}{32} =$ 140.46875 oz.
$140.46875 \times .05 =$ $\$7.02343\frac{3}{4} = \$7\frac{3}{128}$. *Ans.*

56. 11 lbs. 4 oz. $= 136$ oz. Troy
$136$ oz. $\times 480 = 65280$ grs.
$65280 \div 7000 = 9\frac{57}{175}$ lbs. avoirdupois. *Ans.*

57. 1 lb. Av. $= 7000$ grs.
$3\frac{1}{3} \times 24 = 80$ grs.
$7000 \div 80 = 87\frac{1}{2}$ rings.

58. 2 lb. 8 oz. Av. $= 40$ oz.
$40 \times 437\frac{1}{2} = 17500$ grs.
$17500 \div 480 = 36\frac{11}{24}$ oz. Troy.
$36\frac{11}{24} \times \$2 = \$72\frac{11}{12}$. *Ans.*

59. $3\frac{1}{4}$ lbs. Av. $= 22750$ grs.
$22750 \div 480 = 47\frac{19}{48}$ oz. Troy.
$47\frac{19}{48} \times \$17 = \$805\frac{35}{48}$.

# DENOMINATE FRACTIONS.

***Page 202.***

1. Given.

2. $\frac{3}{60}$ bu. $= \frac{3 \times 4 \times 8}{60, 5} = \frac{8}{5}$ qt.

3. £$\frac{1}{396} = \frac{1 \times 20 \times 12}{396, 33} =$ $\frac{20}{33}$ d. *Ans.*

4. $\frac{5}{1000}$ d. $= \frac{5 \times 24, 3}{1000, 288, 25} = \frac{3}{25}$ hour.

5. $\frac{3}{25}$ lb. $= \frac{3 \times 16}{25} = \frac{48}{25}$ oz.

6. $\frac{2}{512}$ sq. ft. $= \frac{2 \times 144, 9}{16, 512, 32} = \frac{9}{16}$ sq. in.

***Page 203.***

7. Given.

8. $\frac{5}{8}$ m. $= \$\frac{5}{8000}$ or $\$\frac{1}{1600}$.

9. $\frac{5}{8}$ far. $= £\frac{5}{7680}$ or $£\frac{1}{1536}$.

10. $\frac{5}{12}$ gr. $= \frac{5}{5760}$ oz. or $\frac{1}{1152}$ oz. *Ans.*

11. $\frac{4}{5}$ gi.$=\frac{3}{160}$ gal. *Ans.*

12. $\frac{4}{3}$ rod$=\frac{7}{960}$ m., or $\frac{1}{480}$ m.

13. $\frac{7}{8}$ lb.$=\frac{7}{16000}$ ton. *Ans.*

### *Page 204.*

14, 15. Given.

16. $£\frac{2}{3}\times 20=\frac{40}{3}$ s.$=13\frac{1}{3}$ s.
$\frac{1}{3}$ s.$\times 12=\frac{12}{3}$ d.$=4$ d.
Hence, $£\frac{2}{3}=13$ s. 4 d.

17. $\frac{15}{16}$ bu.$\times 4=\frac{60}{16}=3\frac{12}{16}$ p.
$\frac{12}{16}\times 8=\frac{96}{16}=6$ qts.
*Ans.* 3 pks. 6 qts.

18. $\frac{5}{8}$ ton$\times 2000=\frac{10000}{8}=$
1250 lbs. *Ans.*

19. $\frac{7}{8}$ lb.$\times 12=\frac{84}{8}=10\frac{4}{8}$ oz.
$\frac{4}{8}\times 20=\frac{80}{8}=10$ pwt.
*Ans.* 10 oz. 10 pwt.

20. $\frac{5}{12}$ m.$\times 8=\frac{40}{12}=3\frac{4}{12}$ fur.
$\frac{4}{12}\times 40=\frac{160}{12}=13\frac{4}{12}$ r.
$\frac{4}{12}\times 5\frac{1}{2}=\frac{22}{12}=1\frac{10}{12}$ yds.
$\frac{10}{12}\times 3=\frac{30}{12}=2\frac{6}{12}$ ft.
$\frac{6}{12}\times 12=\frac{72}{12}=6$ in.
3 fur. 13 r. 1 yd. 2 ft. 6 in.

21. $\frac{11}{12}$ A. $\times$ 160 $=\frac{1760}{12}=$
$146\frac{8}{12}$ sq. r.
$\frac{8}{12}\times 30\frac{1}{4}=\frac{242}{12}=20\frac{2}{12}$
sq. yds.
$\frac{2}{12}\times 9=\frac{18}{12}=1\frac{6}{12}$ sq. ft.
$\frac{6}{12}\times 144=\frac{864}{12}=72$ sq. in.
146 sq. r. 20 sq. yds. 1 sq. ft.
72 sq. in. *Ans.*

22. $\frac{7}{8}$ C. $\times$ 128 $=\frac{896}{8}=112$
cu. ft. *Ans.*

23. Given.

24. 2 qts. 1 pt. $3\frac{1}{2}$ gi. $=47$
half gi.
1 gal.$=64$ half gills.
*Ans.* $\frac{47}{64}$ gal.

25. 5 oz. 2 pwt. 10 gr.$=$
2458 grs.
1 lb.$=5760$ grs.
*Ans.* $\frac{2458}{5760}=\frac{1229}{2880}$ lb.

26. 3 pk. 2 qt. 1 pt.$=53$ pts.
1 bu.$=64$ pts.
*Ans.* $\frac{53}{64}$ bu.

27. 6 cwt. 48 lbs.$=648$ lbs.
1 ton.$=2000$ lbs.
*Ans.* $\frac{648}{2000}=\frac{81}{250}$ ton.

28. 5 sq. ft. $20\frac{4}{5}$ sq. in.$=$
$\frac{3704}{5}$ sq. in.
1 sq. yd.$=\frac{6480}{5}$ sq. in.
*Ans.* $\frac{3704}{6480}=\frac{463}{810}$ sq. yd.

29. 7s. 9d. 2 far.$=374$ far.
£3 10s. 2d.$=3368$ far.
*Ans.* $\frac{374}{3368}=\frac{187}{1684}$.

30. 3 d. 5 hrs. 40 min.$=$
4660 m.
1 wk.$=10080$ min.
*Ans.* $\frac{4660}{10080}=\frac{233}{504}$ wk.

31. $25\frac{3}{5}$ cu. ft.$=\frac{128}{5}$ cu. ft.
1 cord$=\frac{640}{5}$ cu. ft.
*Ans.* $\frac{128}{640}=\frac{1}{5}$ C.

32. 2 m. 1 fur. 2 r.$=682$ r.
5 m. 2 fur. 14 r.$=1694$ r.
*Ans.* $\frac{682}{1694}=\frac{31}{77}$.

*Page 205.*

33. Given.

34. £.125445 × 20 =
2.508900 s.
.508900 × 12 = 6.106800 d.
.106800 × 4 = .427200 far.
*Ans.* 2s. 6d. 0.4272 far.

35. .91225 lb. × 12 =
10.94700 oz.
.947 × 20 = 18.94 pwt.
.94 × 24 = 22.56 grs.
*Ans.* 10 oz. 18 pwt. 22.56 g.

36. .35 m. × 8 = 2.80 fur.
.8 × 40 = 32.0 rods.
*Ans.* 2 fur. 32 rods.

37. .625 gal. × 4 = 2.500 qts.
.5 × 2 = 1.0 pt.
*Ans.* 2 qts. 1 pt.

38. .651° × 60′ = 39.060′.
.06′ × 60″ = 3.60″
*Ans.* 39′ 3.6″.

39. .241 wk. × 7 = 1.687 d.
.687 × 24 = 16.488 hr.
.488 × 60 = 29.280 m.
.28 × 60 = 16.80 sec.
*Ans.* 1 d. 16 h. 29 m. 16.8 s.

40. .25256 ton × 2000 =
505.12000 lbs.
.12 × 16 = 1.92 oz.
*Ans.* 505 lbs. 1.92 oz.

41. .003 lb. × 12 = .036 oz.
.036 × 20 = .720 pwt.
.72 × 24 = 17.28 grs.
*Ans.* 17.28 grs.

42. £5.62542 × 20.
12.50840s. × 12.
6.10080d. × 4.
.4032
*Ans.* £5 12s. 6d. 0.4032 far.

*Page 206.*

43. Given.

44.
24 | 4 grs.
20 | 10.166 + pwt.
12 | 6.5083 oz.
*Ans.* .5423 + lb.

45.
2000 | 10 lb.
*Ans.* 0.005 ton.

46.
$5\frac{1}{2}$ | 4 yds.
40 | 25.7272 + r.
8 | 3.64318 + fur.
*Ans.* .45539 + m.

47.
20 | 9.6 pwt.
12 | .48 oz.
*Ans.* .04 lb.

48.
4 | 3 qt.
$31\frac{1}{2}$ | 15.75
*Ans.* .5 bl.

49. 2 rods = 33 ft.
$2\frac{1}{2}$ fathoms = $13\frac{1}{2}$ ft.
$\frac{1}{2}$ ft. = 6 in.
12 | 6 in.
33 | 13.5 ft.
*Ans.* .409 + rods.

50. 12 | 6d. 12 | 10.5d.
20 | 3.58. 20 | 15.875
£3.175 3.175 | .79375
*Ans.* .25

51. 196 | 94.08 lbs.
*Ans.* .48 bl.

52. 5,5 | 7.92 yds.
*Ans.* 1.44 r.

53. 60 | 10 sec.
60 | 0.166 m.
24 | 4.00277 + hr.
7 | 1.16678 + d.
*Ans.* .16668 + wk.

54. 272.25 | 25 sq. ft.
160 | 45.09182 + sq. r.
*Ans.* .28182 + A.

55. 128 | $53\frac{1}{3}$ cu. ft.
*Ans.* .41666 + C.

## METRIC NOTATION AND NUMERATION.

*Page 212.*

1. 5370.9845 deka m.;
537.09845 hecto m.;
53.709845 kilo m.;
537098.45 decimeters.

2. 450.5108 dekagrams;
450510.8 centigrams;
45.05108 hectograms;
4.505108 kilograms;
45051.08 decigrams.

## REDUCTION OF METRIC WEIGHTS AND MEASURES.

*Page 213*

1. Given.
2. 43.75 ha. = 437500 sq. m.
3. 867 kilos. = 867000 grams.
4. 264.42 hl. = 26442 liters.
5. 2561 A. = 256100 sq. m.
6. 8652 c.m. = 8652000 c. dm.
7. 4256.25 kg. = 4256250 g.
8. Given.
9. 652254 sq. m. = 65.2254 ha.
10. 87 m. = 0.087 kilometers.
11. 1482.35 g. = 1.48235 kg.
12. 39267.5 l. = 39.2675 kl.
13. 812067 ca. = 81.2067 ha.

## APPLICATIONS OF METRIC WEIGHTS AND MEASURES.

***Page 215.***

1, 2. Given.

3. .62137 × 63 = 39.14631 m.

4. 19.8131¼ gals.

5. 15.89 bushels.

6. 4.2324 oz.

7. 303.68365 lbs.

8. Given.

9. 148.87775 Acres.

10. 4237.92 cu. ft.

11. Given.

12. 63 yds. 3 qrs. = 2295 in.
2295 ÷ 39.37 = 58.293 + m.

13. 13750 ÷ 2.2046 =
6236.959 + kilos.

14. 236.585 + litres.

15. 2056 bu. 3 pks. =
2056.75 bu.
2056.75 ÷ 28.372 =
72.492 + kl.

16. 3 cwt. 15 lbs. 12 oz. =
315.75 lbs.
315.75 ÷ 2.2046 =
143.223 + kg.

17. 7176 sq. yds. = 9300096 sq. in.
9300096 ÷ 1550 =
6000.06 + sq. m.

18. 16.378 + hectares.

19. 410.748 + cu. m.

20. 27958.715 + cu. m.

## COMPOUND ADDITION.

***Page 217.***

1, 2. Given.

3. £11 10s. 0d. 2 far.

4. 26 T. 3 cwt. 83 lbs. 3 oz.

5. 45 bu. 0 pk. 2 qts.

6. 74¾ yds. or 74 y. 2 ft. 3 in.

7. 1093 lbs. 5 oz.

8. 55 gals. 2 qts.

9. 196 bu. 2 pks. 7 qts.

10. 6 C. 80 cu. ft.

11. 98 bu. 3 pk. 2 qts.

***Page 218.***

12. Given.

13. 23 wk. 1 d. 17 hrs. 58 m.

14. 64 A. 7 sq. rods 10½ sq. yards. *Ans.*

15, 16. Given.

17. .75 T. = 15 cwt. 0 lb. 0 oz.
.5 h. = 0 " 50 " 0 "
.25 lbs. = 0 " 0 " 4 "
*Ans.* 15 cwt. 50 lb. 4 oz.

18. .25 bu. = 1 pk. 0 qts.
½ of 3 pks. = 1 " 4 "
*Ans.* 2 pk. 4 qts.

19.
¾ lb. = 9 oz. 0 p. 0 g.
1/20 oz. = 0 1 0
5/12 p. = 0 0 10
*Ans.* 9 oz. 1 p. 10 g.

20. .15£ = 3s. 0d. 0 far.
.5s. = 0 6 0
.8d. = 0 0 3.2
*Ans.* 3s. 6d. 3.2 far.

21. ¼ A. = 40 sq. r.
⅛ A. = 60 sq. r.
121½ sq. r.
150½ sq. r.
372 sq. r.
372 sq. r. = 2 A. 52 sq. r.

22. ⅘ C. = 0 C. 102 cu. ft. 691⅕ cu. in.
75.3 cu. ft. = 0 C. 75 " 518 4/10 "
1¼ C. = 1 C. 32 " 0 "
*Ans.* 2 C. 81 cu. ft. 1209⅗ cu. in.

# COMPOUND SUBTRACTION.

***Page 219.***

1. Given.

2. 1 m. 0 r. 0 yd. 0 ft.
240 " 3 " 2 "
79 r. 1½ yd. 1 ft.; or
1 fur. 39 r. 1 yd. 2½ ft. *Ans.*

3. 7 lb. 4 oz. 17 pwt. 9 gr.

4. 12 T. 9 cwt. 41 lbs.
5 " 1 " 15 "
7 T. 8 cwt. 26 lbs. *Ans.*

5. 8 g. 1 qt. 1 pt. 2 gi.

***Page 220.***

6. 159 A. 12 sq. r. 222¼ sq. ft.

7. 46 cu. ft. 1689 cu. in.

8. 145 A. 21 sq. r.

9. 46⅛ yds.

10.

| m. | fur. | r. | yd. | ft. | in. |
|---|---|---|---|---|---|
| 10 | 2 | 27 | 0 | 1 | 7 |
| 6 | 4 | 28 | 1 | 0 | 0 |
| 3 | 5 | 38 | 4½ | 1 | 7 |

But ½ yd. = 1 ft. 6 in. And this added to 1 ft. 7 in. = 1 yd. 1 in. Hence, 3 m. 5 fur. 38 r. 5 yd. 0 ft. 1 in. *Ans.*

1. Given.

2. £.525 × 20 × 12 = 10s. 6d.
.75s. × 12 = 9d.
*Ans.* 9s. 9d.

3. $\frac{7}{8}$ bu. = 3 pk. 4 qt. 0 pt.
$\frac{4}{5}$ pk. = 0 " 6 " 0.8 "
*Ans.* 2 pk. 5 qt. 1.2 pt.

4. $\frac{3}{4}$ gal. = 6 pt.
$1\frac{4}{5}$ pt. = 1.8 "
4.2 pt. *Ans.*

5.

| | lb. | oz. | pwt. |
|---|---|---|---|
| 1.25 lbs. = | 1 | 3 | 0 |
| .15 oz × 6 = | 0 | 0 | 18 |
| *Ans.* | 1 | 2 | 2 |

6. .875 A. = 140 sq. r.
12.8 r. × 2 = 25.6 "
*Ans.* 114.4 sq. r.

7. $\frac{3}{4}$ of $\frac{5}{6,2} = \frac{5}{8}$ cwt. = 62.5 lbs.
minus 31.25 "
*Ans.* 31.25 lbs.

### *Page 221.*

1, 2. Given.

3. 67 y. 9 m. 22 d.

### *Page 222.*

1. Given.

2. Nov. 30 − 10 = 20
Dec. = 31
Jan. = 31
Feb. = 28
March = 3
*Ans.* 113 d.

3. Aug. 31 − 19 = 12
Sept. = 30
Oct. = 31
Nov. = 1
*Ans.* 74 days.

4. Feb. = 28
Mar. = 31
Apr. = 30
May = 31
June = 30
*Ans.* 150 days.

5. 224 days.

6. 101 d., including April 1.

### *Page 223.*

7, 8, 9. Given.

10. 13° 24′ 0″ E.
plus 72° 55′ 24″ W.
*Ans.* 86° 19′ 24″

11. 7° 24′ 7″.

12. 18° 2′.

13. 5° 6′ 46″.

14. 15° 4′ 16″.

15. 3° 12′ W.
plus 16° 23′ E.
19° 35′ *Ans.*

16. 33° 2′ S.
plus 23° 9′ N.
56° 11′ *Ans.*

17. 70° 29′.

18. 10° 19′ 38″.

# COMPOUND MULTIPLICATION.

*Page 224.*

2. 98 T. 17 cwt. 28 lb.
3. £151 15s. 9¾d.
4. 33 oz. 15 pwt. 10 grs.

*Page 225.*

5, 6. Given.
7. 331 gal. 2 qt.
8. 22 C. 91 cu. ft.
9. £23 15s. 3¾d.
10. 562 m. 4 fur. 24 r.
11. 1937 bu. 1 pk.
12. 22 C. 57 cu. ft.
13. 5 T. 237 lbs.
    12
    61 T. 844 lbs. *Ans.*
14. 1307 r. 8 qr. 8 sh.
15. 161° 37′ 30″.
16. 15 × 5 = 75 days.
    5 h. 45 m. × 75 =
    431 h. 15 m. *Ans.*
17. 12 sq. r. 4 sq. y. 6 sq. ft.
    11
    133 sq. r. 20¾ sq. y. 3 sq. ft.
    But (¾ sq. yd. =) 6¾ ft.;
    hence,
    133 sq. r. 21 sq. yd. ¾ sq. ft.
18. 73 T. 1492 lbs.
19. 1571 bu. 2 pk. 4 qts.
20. 1946 gal. 3 qt. 1 pt.

# COMPOUND DIVISION.

*Page 227.*

1, 2. Given.
3. 4 fur. 8 r. 2 y. $2\frac{1}{14}$ ft.
4. 6 g. 3 qt. 0 pt. $3\frac{7}{8}$ gi.
5. 25 bu. 0 pk. 1 qt. $\frac{4}{5}$ pt.
6. 15 A. 106 sq. r. 5 sq. y. $2\frac{8}{25}$ sq. ft.
7. 2 oz. 10 pwt. = 50 pwt.
   5 lb. 6 oz. = 1320 pwt.
   1320 ÷ 50 = $26\frac{4}{5}$ spoons.
8. 15 m. × 5280 = 79200 ft.
   79200 ÷ 18 = 4400
   4400 × 2 = 8800 rails.
9. 15 ft. 6 in. = 186 in.
   3 m. 25 r. 10 ft. =
   195150 in.
   195150 in. ÷ 186 in. =
   $1049\frac{6}{31}$ times. *Ans.*
10. 4s. 6¼d. = 54.25d.
    £2 140.3d. = 651d.
    651d. ÷ 54.25d. = 12 b'ks.

11. 1 man will mow $\frac{1}{6}$ as much as 6 men; and 86 A. 64 sq. r. $\div 6 = 14$ A. and 64 sq. r. Now if 1 man can mow 14 A. and 64 sq. r. in 6 days, he can mow $\frac{1}{6}$ of it in 1 day. And 14 A. 64 sq. r. $\div 6 = 2$ A. 64 sq. r. *Ans.*

12. 6 bu. 1 pk. 1 qt.

## COMPARISON OF TIME AND LONGITUDE.

***Case I. Page 228.***

1. Given.

2. 15)10° 53′ 2″
*Ans.* 43 m. 32.13 + sec.

3. 83° 2′ 30″ Detroit.
71° 3′ 30″ Boston.
15)11° 59′ 00″ Dif. Lon.
*Ans.* 47 m. 56 s. Dif. time.
12 o'cl., 0 m. 0 s. Boston.
minus 47 m. 56 s. Dif.
11 o'cl., 12 m. 4 s. *Ans.*

4. 84° 27′ 0″ Cincin'ti.
75° 9′ 54″ Phila.
15) 9° 17′ 6″ Dif. Lon.
37 m. 8.4 s. Dif. time.
12 o'cl., 0 m. 0 sec. Cin.
plus 37 m. 8.4 s. Dif.
12 o'cl., 37 m. 8.4 s. Phil.

5. 85° 30′ Louisville.
73° 10′ Burlington.
15)12° 20′ Dif. Lon.
*Ans.* 49 m. 20 sec., dif. time.

6. 15)22° 30′
1 h. 30 m., dif. time.
12 o'cl. 0 m., Wash'n.
1 h. 30 m.
*Ans.* 1 o'cl. 30 min. at all places E. of Washington.
12 o'cl. 0 m., Wash'n.
1 h. 30 m.
10 h. 30 m. Hence,
*Ans.* 10 o'cl. 30 min. at all places W. of Washington.

7. 87° 35′ 0″ Chicago.
74° 0′ 3″ N. York.
15)13° 34′ 57″ Dif. Lon.
*Ans.* 54 m. 19.8 s. D. time.

8. 90° 15′ 16″ St. Louis.
86° 49′ 3″ Nashville.
15) 3° 26′ 13″ Dif. Lon.
13 m. 44.86 + sec.

*Case II. Page 229.*

9. Given.

10. 24 m. 36 sec.
15
*Ans.* 6° 9′ Dif. Lon.

11. 27 m. $\frac{1}{2}$ sec.
15
6° 45′ 5″ *Ans.*

12. 3 h. 1 m. 39 sec.
15
45° 24′ 45″ *Ans.*

13. 625 m. ÷ 44 = $14\frac{9}{44}$° Dif. Lon.
15)14° 12′ $16\frac{4}{11}$″
*Ans.* 56 m. $49\frac{1}{11}$ sec.

14. 400 ÷ 46 = $8\frac{16}{23}$° or 8.6956528° =
8° 41′ 44.5″ nearly. (Art. 294.)
15)8° 41′ 44.5″ Dif. Lon.
34 m. 46.7 sec. Dif. of time.

Then, 12 o'clock 0 m. 0 sec. Columbus time.
plus 34 m. 47 sec.
*Ans.* 12 o'clock 34 m. 47 sec. nearly, at Trenton.

Or, $\frac{400}{46}$° = dif. of Lon. Then
$\frac{400}{46}$° ÷ 15 = $\frac{400}{690}$ hr. Reducing this to minutes,
we have (Art. 292),
$\frac{400}{690} \times 60 = \frac{24000}{690}$ min.
690)24000
34 m. 47 sec. nearly.
*Ans.* 12 o'clock 34 m. 47 sec. nearly.

# PERCENTAGE.

## *Page 231.*

1. .02; .06; .08; .14; .20; .35; .60; .72.

2. .80; 1.01; 1.04; 1.50; 2.10; 3.00.

3. .015; .04$\frac{1}{3}$; .062; .0825; .1075.

4, 5, 6. See Book.

## *Page 232.*

7, 8. Given.

9. 5% is equivalent to .05, and .05$=\frac{5}{100}=\frac{1}{20}$.
10%$=\frac{10}{100}=\frac{1}{10}$; 4%$=\frac{4}{100}=\frac{1}{25}$; 20%$=\frac{20}{100}=\frac{1}{5}$.
25%$=\frac{25}{100}=\frac{1}{4}$; 50%$=\frac{50}{100}=\frac{1}{2}$; 75%$=\frac{75}{100}=\frac{3}{4}$.

10. NOTE.—It is advisable to express the fractional parts of 1 per cent decimally, if it can be done. If not, they may be expressed either by a *compound* or by a *complex* fraction making 100 the denominator.

$6\frac{1}{4}\%=.0625=\frac{625}{10000}=\frac{1}{16}$.
Or, $6\frac{1}{4}\%=\frac{25}{4}\%=\frac{25}{4}$ of $\frac{1}{100}=\frac{25}{400}=\frac{1}{16}$.
Or, $6\frac{1}{4}\%=\frac{6\frac{1}{4}}{100}=\frac{25}{4}\div 100=\frac{1}{16}$. (Art. 152.)
$12\frac{1}{2}\%=.125=\frac{125}{1000}=\frac{1}{8}$.
Or, $12\frac{1}{2}\%=\frac{25}{2}\%=\frac{25}{2}$ of $\frac{1}{100}=\frac{25}{200}=\frac{1}{8}$;
$8\frac{1}{3}\%=\frac{25}{3}\%=\frac{25}{3}$ of $\frac{1}{100}=\frac{25}{300}=\frac{1}{12}$.
Or, $8\frac{1}{3}\%=\frac{8\frac{1}{3}}{100}=\frac{25}{3}\div 100=\frac{25}{300}=\frac{1}{12}$;
$33\frac{1}{3}\%=\frac{100}{3}\%=\frac{100}{3}$ of $\frac{1}{100}=\frac{100}{300}=\frac{1}{3}$;
$62\frac{1}{2}\%=\frac{125}{2}\%=\frac{125}{2}$ of $\frac{1}{100}=\frac{125}{200}=\frac{5}{8}$.
Or, $62\frac{1}{2}\%=.625=\frac{625}{1000}=\frac{5}{8}$.

11. $\frac{1}{2}\%=.005=\frac{5}{1000}=\frac{1}{200}$; $\frac{2}{5}\%=.004=\frac{4}{1000}=\frac{1}{250}$;
$\frac{3}{4}\%=.0075=\frac{75}{10000}=\frac{3}{400}$; $\frac{1}{3}\%=\frac{1}{3}$ of $\frac{1}{100}=\frac{1}{300}$;
$\frac{2}{3}\%=\frac{2}{3}$ of $\frac{1}{100}=\frac{2}{300}=\frac{1}{150}$; $\frac{1}{9}\%=\frac{1}{9}$ of $\frac{1}{100}=\frac{1}{900}$;
$\frac{8}{25}\%=\frac{8}{25}$ of $\frac{1}{100}=\frac{8}{2500}=\frac{2}{625}$; 25%$=.25=\frac{25}{100}=\frac{1}{4}$.

13. 2)1.00; 4)1.00; 4)3.00; 5)1.00;
.50 .25 .75 .20 *Ans.*
5)2.00; 5)3.00; 5)4.00
.40 .60 .80 *Ans.*

14. $\frac{1}{10}$=.10; $\frac{7}{10}$=.70; $\frac{9}{10}$=.90; $\frac{1}{20}$=.05; $\frac{7}{20}$=.35; $\frac{3}{25}$=.12; $\frac{3}{50}$=.06.

15. $\frac{2}{3}$=.66$\frac{2}{3}$; $\frac{1}{6}$=.16$\frac{2}{3}$; $\frac{1}{8}$=.12$\frac{1}{2}$=.125; $\frac{5}{8}$=.625; $\frac{7}{8}$=.875; $\frac{7}{12}$=.58$\frac{1}{3}$; $\frac{11}{12}$=.91$\frac{2}{3}$.

## *Problem I. Page 233.*

NOTE.—The Problem to find the *Percentage*, when the Base and Rate are given, we have seen, is the same in principle as finding a *fractional part* of a number, or *multiplying* by a *common* or *decimal fraction*. (Art. 336, N. 3.) This relation or identity should be illustrated by solving several examples by each method in succession, Thus,

1st. To find a *given per cent* of a number. (Art. 336.)

What is 4% of 1200?

ANALYSIS.—4% is .04; hence, 4% of 1200 = .04 times 1200, and 1200 × .04=48.00. *Ans.*

2d. To find a *fractional part* of a number. (Art. 143.)

How many are $\frac{4}{100}$ of 1200?

ANALYSIS.—$\frac{4}{100}$ of 1200=4 times $\frac{1}{100}$ of 1200. Now $\frac{1}{100}$ of 1200 =$\frac{1200}{100}$, and $\frac{4}{100}$ are 4 times $\frac{1200}{100}$=$\frac{4800}{100}$, or 48, the same as above.

3d. To *multiply* by a common or a decimal fraction. (Arts. 165, 191.)

What is the product of 1200 multiplied by $\frac{4}{100}$ or by .04?

SOLUTION.—1200 × $\frac{4}{100}$=$\frac{4800}{100}$=48, the same as before.
And 1200 × .04=48.00, the same as before.

### *Page 234.*

3. $807 × .03=$24.21.
4. 216 × .05=10.8 bu.
5. 282.5 × .08=22.6 yds.
6. 216 × .04=8.64 oxen.
7. 150 × .055=8.25 yds.
8. $72.40 × .16=$11.584.
9. 840 × .12=100.80 lbs.
10. 451 × .14=63.14 tons.
11. 1000 × .05$\frac{1}{4}$=52.5 men.
12. 1428 × .10$\frac{1}{5}$=145.656 m.
13. $1715.57 × .50=$857.785

14. £21.2 × .005 = £0.106.
15. 500 × .00¼ = 1.25 liters.
16. 230 × .00⅗ = 1.38 kilos.
17. 840 × 1.00 = 840 pounds.
18. $500 × 2.00 = $1000.
19. 875 × .09 = 78.75 bu.
20. 3.5 × .10 = .35 lbs.
21. 63 × .155 = 9.765 gal.
22. 4000 × .21 = 840 men.
24. $860 × ¼ = $215.
25. 1572 lbs. × 1/10 = 157.2 lbs.
26. 258 × ⅛ = 32.25 meters.
27. 580 × ⅕ = 116 liters.
28. 25% = ¼.
¼ of 2320 = 580 sheep.
29. 33⅓% = ⅓.
⅓ of 468 = 156 bu.
30. 50% = ½.
½ of $1850 = $925.
31. 33⅓% = ⅓.
⅓ of 1728 cu. ft. = 576 cu. ft.
32. ⅛ of £16.4 = £2.05 = £2 1s.

***Problem II.* Page 236.**

1, 2. Given.

3. 1000 × 1.15 = 1150 C.
1000 × .88 = 880 D.

4. $2150.38 × 1.07 = $2300.9066.

5. $3000 × .95 = $2850.
6. 450 × 1.12 = 504 bales.
7. 2375 × .85 = 2018.75 gals
8. 1640 × .80 = 1312 mel'ns.
9. $420 × 1.12 = $470.40.
10. 150 × .86 = 129 turkeys.
11. 2500 × .91 = 2275 bas.
2275 × .62 = $1410.50.
12. 4560 × 1.25 = 5700 or.
5700 × .04 = $228.00.
13. $7235 × ⅓ = $2411.66⅔.
$7235 − 2411.66⅔ = $4823.33⅓.
14. $8500 × 1.20 = $10200.
15. $10000 × .975 = $9750.00

***Problem III.* Page 237.**

NOTE.—The Problem to find the *Rate*, when the Base and Percentage are given, or to find what *per cent* one number is of another, we have seen, is the same in principle as finding *what fractional part* one number is of another, then changing the fraction to *hundredths*. (Art. 339, N. 1.)

1st. To find the *Rate*, or what *per cent* one number is of another.

What per cent of 40 is 8?

ANALYSIS.—Here 40 is the base, and 8 the percentage. Now 8 is ⅘ of 40, and 8 ÷ 40 = .20, or 20%.

Or, thus: Since 40, the base, is 100% of itself, 1 which is $\frac{1}{40}$ of 40, must be $\frac{1}{40}$ of 100%, and 8 is 8 times $\frac{1}{40}$ of 100%, or $\frac{8}{40}$ of 100%; and $100\% \times \frac{8}{40} = \frac{800}{40}$, or 20%.

2d. To find *what fractional part* one number is of another.

What part of 40 is 8?

ANALYSIS.—8 is $\frac{8}{40}$ of 40; and $\frac{8}{40} = \frac{20}{100}$, or .20. (Arts. 150, 173.)

But the common fraction $\frac{20}{100}$ and the decimal .20 are each equal to 20%, the same as before.

2. 15)200
$13\frac{1}{3}\%$ *Ans.*

3. $5 \div 20 = .25$ or 25%.

4. $16 \div 48 = 33\frac{1}{3}\%$.

5. $\$0.75 \div \$5 = 15\%$.

6. $158 = £.75 \div £8 = 9\frac{3}{8}\%$.

7. 56 g. = 224 qts.
7 qts. $\div$ 224 = .03$\frac{1}{8}$ or $3\frac{1}{8}\%$.

8. $\$5 = 50$ dimes.
5 dimes $\div$ 50 = 10%.

9. $\frac{1}{2}$ T. $\div \frac{5}{8}$ T. $= \frac{4}{5} = 80\%$.

10. 9 parts + 1 part = 10 p'rts.
The question then is, what per cent of 10 is 1?
Now $1 \div 10 = .10$ or 10%.

11. 15 gal. $\div$ 63 gal. $= 23\frac{1}{21}\%$.

12. $\frac{3}{7}$ of 560 = 240 bbls. sold.
$240 \div 560 = 42\frac{6}{7}\%$. *Ans.*

13. $\$475 - 110 = \$365$, horse.
$110 \div 365 = 30\frac{10}{73}\%$. *Ans.*

## *Problem IV. Page 238.*

NOTE.—The Problem to find the *Base*, when the Percentage and Rate are given, we have seen, is the same in principle as finding a number, when a *fractional part* of it is given. (Art. 340, N. 1.)

1st. To find the *base*, when a percentage of it is given.

60 is 20% of what number?

ANALYSIS.—Since 60 is 20% of a certain number, 1% of that number must be $\frac{1}{20}$ of 60, which is 3, and 100%, 100 times 3, or 300. Therefore 60 is 20% of 300.

2d. To find a number, when a *fractional part* of it is given. (Art. 174.)

60 is $\frac{20}{100}$ of what number?

ANALYSIS.—Since $\frac{20}{100}$ of a certain number is 60, 1 hundredth is $\frac{1}{20}$ of 60, which is 3, and $\frac{100}{100} = 3 \times 100 = 300$, the same as above.

Or $\frac{20}{100}=\frac{1}{5}$. Now since 1 fifth of a certain number is 60, 5 fifths must be 5 times 60, which is 300, the same as before.

1–3. Given.

4. $15\div.06=250$ bu.

5. $\$29\div.08=\$362.50$.

6. $45\div.25=180$ T.

7. $£150\div.33\frac{1}{3}=£450$.

8. $37.5\div.06\frac{1}{4}=600$.

9. $45\div\frac{1}{8}=360$ francs.

10. $40\div.005$ ($\frac{1}{2}\%$) $=8000$.

11. $\$.50\div.0025=\$200$.

12. $\frac{3}{5}\%=.006$, and $\$100\div.006=\$16666.66\frac{2}{3}$.

13. $\$35.20\div.002=\$17600$.

14. 54.4 yds.

### *Page 239.*

15. 2% of $\$150=\$3.00$, and $\$3.00\div.06=\$50$. *Ans.*

16. 12% of $500=60.00$, and $60.00\div.60=100$.

17. $\$50\div.01=\$5000$.

18. $\$600\div.31\frac{1}{4}=\$1920$, income.

19. $315+110+70=495$;
$495\div165=3000$ men.

20. $450\times12=5400$ in a year.
$5400\div.015=360000$ p.

### *Problem V. Page 240.*

1–4. Given.

5. $33\frac{1}{3}=\frac{1}{3}$; $1-\frac{1}{3}=\frac{2}{3}$;
$539\frac{1}{3}=\frac{1618}{3}$.
$\frac{1618}{3}\div\frac{2}{3}=\frac{1618}{2}=809$.
Or, by Analysis, $539\frac{1}{3}=\frac{2}{3}$ of the number. Then $\frac{1}{3}$ of it is $539\frac{1}{3}\div2=269\frac{2}{3}$, and $\frac{2}{3}$ or the whole is $269\frac{2}{3}\times3=809$. *Ans.*

6. $2275\div1\frac{1}{4}=1820$.

7. Given.

8. $\frac{4}{5}\div\frac{9}{10}=\frac{8}{9}$. *Ans.*
Or, $\frac{4}{5}=\frac{8}{10}$, 10% or $\frac{10}{100}=\frac{1}{10}$. Now $\frac{10}{10}-\frac{1}{10}=\frac{9}{10}$; and $\frac{8}{10}\div\frac{9}{10}=\frac{8}{9}$. *Ans.* (Art. 169.)

9. $16\frac{2}{3}\%=\frac{1}{6}$; $1-\frac{1}{6}=\frac{5}{6}$.
$\frac{1}{4}\div\frac{5}{6}=\frac{3}{10}$, B's part.

10. $1-.28=.72$.
$3726\div.72=5175$ men.

11. $\$4560\div1\frac{1}{4}=\$3648$. *Ans.*

12. $8250\div1.20=6875$ pop.

13. $\$2010\div.60=\$3350$, income.

14. $15\%+10\%=25\%$;
$1-.25=.75$.
$171\div.75=228$ sheep.

15. $1-7\frac{1}{2}\%=.925$.
$370\div.925=400$ pupils.

16. $5220\div.90=5800$ men.

## COMMISSION AND BROKERAGE.

*Page 242.*

3. $958.25 × .0325 = $31.1431¼.

4. $11268.45 × .0325 = $366.225; $11268.45 − 366.225 = $10902.225.

*Page 243.*

5. .02½ + .03 = .055.
$4561 × .055 = $250.855.
$4561 − $250.855 = $4310.145.

6. $0.16⅔ = $⅙.
1530 lbs., @ $⅙ = $255.
$255 × .02¼ = $5.73¾.
$5.73¾ + $7.50 + $3.10 − $16.33¾.
$255 − 16.33¾ = $238.66¼.

7. Given.

8. $19 ÷ $3800 = .005 = ½% commission.

9. $350 ÷ 7000 = .05 or 5% commission.

10. $118.05 ÷ $19675 = .006 = ⅗% commission.

11. Given.

*Page 244.*

12. $45 ÷ .005 = $9000, am't sold.

13. .025 + .025 = .05.
$210.60 ÷ .05 = $4212, sales.
$4212 − $210.60 = $4001.40, net proceeds.

14. $67.50 ÷ .045 = $1500, amount collected.
$1500 − $67.50 = $1432.50, paid treasurer.

15. $135 ÷ .015 = $9000, selling price.
$9000 − 135 = $8865, p'd owner.

16. Given.

17. 1 − .05 = .95.
$4845 ÷ .95 = $5100, amount collected.

18. 1 − .025 = .975.
$6664 ÷ .975 = $6834.872 sales.
$6834.872 − 6664 = $170.872, commission.

*Page 245.*

19. 1 − .0125 = .9875.
$15250 + 45.28 = $15295.28.
$15295.28 ÷ .9875 = $15488.89+ *Ans.*

20. 1 — .0225 = .9775.
$25686 + $350 = $26036.
$26036 ÷ 9775 =
$26635.294 +. *Ans.*

22. $3131.18 ÷ 1.04 =
$3010.75.

23. $2516 ÷ 1.04 =
$2419.23$\frac{1}{13}$

24. $50000 ÷ 1.015 =
$49261.083 +, invested.
$50000 — $49261.083 =
$738.9163, commission.

## ACCOUNT OF SALES.

***Page 246.***

25. *Sales on acc't of* J. HAMILTON, *of Cincinnati.*

| | | | | |
|---|---|---|---|---|
| To W. Gerard & Co., | 300 bbls. pork, | @ | $27.00 | $8100.00 |
| " J. Ramsey, | 1150 hams, | @ | $1.75 | 2012.50 |
| " H. Parker, | 875 kegs lard (50 lb. ea.), | @ | .08 | 3500.00 |
| " Thos. Young, | 750 lb. cheese, | @ | .10 | 75.00 |
| | *Gross Amount,* | | | $13687.50 |
| | *Charges.* | | | |
| Freight, | | | $65.30 | |
| Cartage, | | | 15.25 | |
| Insurance, | | | 6.45 | |
| Commission, 2%, | | | 273.75 | 360.75 |
| | *Net Proceeds,* | | | $13326.75 |

PHILADELPHIA. JAMES PENFIELD.

26. *Sales on acc't of* JAMES FIELD, *of St. Louis.*

| | | | | |
|---|---|---|---|---|
| 85 bales of cotton, | | @ | $96.50 | $8202.50 |
| 63 barrels sugar, | | @ | 48.25 | 3039.75 |
| 37 " molasses, | | @ | 35.00 | 1295.00 |
| | *Gross Amount,* | | | $12537.25 |
| | *Charges.* | | | |
| Freight, | | | $45.50 | |
| Insurance, | | | 15.00 | |
| Storage, | | | 35.50 | |
| Commission, 2½%, | | | 313.43 | 409.43 |
| | *Net Proceeds,* | | | $12127.82 |

SAMUEL BARRETT.

NEW ORLEANS.

# PROFIT AND LOSS.

### *Page 247.*

1, 2. Given.

3. $\$185 \times .12 = \$22.20$, loss.

4. $20\% = \frac{1}{5}$. Now,
$\frac{1}{5}$ of $\$110 = \$22$, profit.

5. $\$.875 \times .10 = \$.0875$, loss.

6. $20\% = \frac{1}{5}$. Now,
$\$83.25 \times \frac{1}{5} = \$16.65$, loss.
Or, $\$83\frac{1}{4} = \frac{333}{4}$.
$\frac{1}{5}$ of $\frac{333}{4} = \$16.65$. *Ans.*

7. $33\frac{1}{3}\% = \frac{1}{3}$. Now,
$\frac{1}{3}$ of $\$4.20 = \$1.40$, gain.

### *Page 248.*

8, 9. Given.

10. $\$2500 \times 1.17 = \$2925.00$,
A's property.
$\$2500 \times .83 = \$2075.00$,
B's property.

11. $\$378 \times 1.20 = \$453.60$,
selling price.
Or, $\$378 \times \frac{1}{5} = \$75.60$.
$\$378 + \$75.60 = \$453.60$.

12. $\$2750 \times 1.07 = \$2942.50$.

13. $\$8000 \times 1.19 = \$9520.00$,
1 year's business.

14. $\$.15 \times .75 = 11\frac{1}{4}$ c. per yd.

15. $\$15 \times .80 = \$12$ a doz.
Or, $\$1$ a pair. *Ans.*

16. $\$25 \times 1.33\frac{1}{3} = \$33\frac{1}{3}$.
Or, $\frac{4}{3}$ of $\$25 = \frac{100}{3} = \$33\frac{1}{3}$
per doz.
$\$33\frac{1}{3} \div 12 = \$2.77\frac{7}{9}$ apiece.

### *Page 249.*

17. $196 \div 50 = \$3.92$, cost per
yard.
$25\% = \frac{1}{4}$. $1 + \frac{1}{4} = \frac{5}{4}$.
$\$3.92 \times \frac{5}{4} = \frac{1960}{4} = \$4.90$.

18. $12\frac{1}{2}\% = \frac{1}{8}$. $1 + \frac{1}{8} = \frac{9}{8}$;
$\frac{9}{8}$ of $\$3850 = \frac{\$34650}{8} =$
$\$4331.25$. *Ans.*

19. $1 - .08\frac{1}{2} = .915$.
$\$14000 \times .915 =$
$\$12810.00$. *Ans.*

20. Given.

21. $\$250 \div \$875 = 28\frac{4}{7}\%$, loss.

22. $\$.025 \div .225 = 11\frac{1}{9}\%$, prof.

23. $.015 \div .025 = 60\%$, profit.

24. Given.

25. ANALYSIS.—Every number is 100% of itself. (Art. 332, N. 2.) Now if a thing is sold at double the cost, the profit is equal to the cost, and being equal, must be 100% of it. Or thus: If the cost is $\$1$, the selling price, to be double, must be $\$2$. Hence, the profit is $\$1$. Now $\$1 \div \$1$, or $\frac{1}{1} = 100\%$. *Ans.* (Art. 334.)

26. $1-\frac{1}{2}=\frac{1}{2}$; $.5\div 1=.50$ or 50% loss.

27. $\$5-\$3=\$2.00$, profit;
$\$2.00\div\$3.00=66\frac{2}{3}\%$, pr.

28. $\$5.00-\$3.00=\$2.00$, l's.
$\$2.00\div\$5.00=40\%$, loss.

### *Page 250.*

29. $\$3560-\$1780=\$1780$;
$\$1780\div\$3560=50\%$, l's.

30. Given.

31. If you sell $\frac{1}{4}$ an article for $\frac{3}{4}$ the cost of the whole, you sell the whole for $\frac{6}{4}$ its cost. Hence, $\frac{6}{4}-\frac{4}{4}=\frac{2}{4}$, profit. Now $\frac{2}{4}=\frac{1}{2}=50\%$. *Ans.*
Or, $\frac{3}{4}-\frac{1}{4}=\frac{2}{4}$, profit.
$\frac{2}{4}\div\frac{4}{4}=.50$, or 50% gain.

32. If I sell $\frac{2}{3}$ of a bbl. for the price paid for $\frac{3}{5}$, for $\frac{1}{3}$ bbl. I get $\frac{1}{3}$ of $\frac{3}{5}=\frac{3}{15}$, and for the whole bbl. or $\frac{3}{3}$ I should get $\frac{3}{15}\times 3=\frac{9}{15}$.
Then $\frac{9}{15}-\frac{6}{15}=\frac{3}{15}$, profit.
And $\frac{3}{15}\div\frac{6}{15}=\frac{3}{6}=50\%$.
Or, $\frac{3}{5}-\frac{2}{3}=\frac{1}{15}$, profit.
$\frac{1}{15}\div\frac{2}{3}=\frac{1}{2}=50\%$. *Ans.*

33. $\frac{4}{4}-\frac{3}{4}=\frac{1}{4}$, profit.
$\frac{1}{4}$ (profit) $\div\frac{3}{4}$ (cost) $=\frac{1}{3}$ or $33\frac{1}{3}\%$. *Ans.*

34. 3 hhd. $\times$ 63 = 189, gal.
$189\times.85=\$160.65$, cost.
$1=63\text{g.}\times.75=\$47.25$
$2=126\text{g.}\times\$1=\$126.00$
Sell. pr., 3 hhd. $=\$173.25$
$\$173.25-\$160.65=$
$\$12.60$, profit.
$\$12.60\div\$160.65=7\frac{43}{81}\%$, pr.

35. Given.

36. $20\%=\frac{1}{5}$.
$\$1950\div\frac{1}{5}=\$9750$, cost.

37, 38. Given.

### *Page 251.*

39. $10\%=\frac{1}{10}$.
$.10\div\frac{1}{10}=\$1.00$, cost per lb.

40. $33\frac{1}{3}\%=\frac{1}{3}$.
$\$7500\div\frac{1}{3}=\$22500$, cost.
$\$22500+\$7500=\$30000$, selling price.

41. $20\%=\frac{1}{5}$.
$\$3500\div\frac{1}{5}=\$17500$, sum invested.
$\$17500+\$3500=\$21000$ sales.

42. $12\frac{1}{2}\%=\frac{1}{8}$.
$\$1500\div\frac{1}{8}=\$12000$, A's investment.
$\$1500\div.16=\$9375$, B's investment.

43. 10% = $\frac{1}{10}$.
$25000 ÷ $\frac{1}{10}$ = $250000, cost.
$250000 + $25000 = $275000, amount sales.

44. 25% = $\frac{1}{4}$.
$\frac{1}{2} ÷ \frac{1}{4} = \frac{4}{2}$ = 2 cts., cost.
2 cts. + $\frac{1}{2}$ ct. = 2$\frac{1}{2}$ cts., selling price.

45, 46. Given.

47. 5000 A. × $3$\frac{1}{4}$ = $16250, selling price.
$16250 ÷ 1.22 = $13319.672, cost.

48. £27 10s. = 550s.
25% = $\frac{1}{4}$.
550s. ÷ $\frac{5}{4}$ = $\frac{2200}{5}$ = 440s. = £22, cost.

*Page 252.*

49. 33$\frac{1}{3}$% = $\frac{1}{3}$.
4 cts. ÷ $\frac{4}{3}$ = $\frac{12}{4}$ = 3 cents apiece.

50. Given.

51. 100% + 25% = 1.25.
$.56 × 1.25 = .70.
100% − 5% = .95.
.70 ÷ .95 = $.736 + marked price.

52. 33$\frac{1}{3}$% = $\frac{1}{3}$; $\frac{1}{3} + \frac{3}{3} = \frac{4}{3}$.
$24 × $\frac{4}{3}$ = $\frac{96}{3}$ = $32.
100% − 8% = .92.
$32 ÷ .92 = $34.78$\frac{6}{23}$, marked price.

53. 16$\frac{2}{3}$% = $\frac{1}{6}$; $\frac{1}{6} + \frac{6}{6} = \frac{7}{6}$.
$3.60 × $\frac{7}{6}$ = $\frac{2520}{6}$ = $4.20.
100% − 12$\frac{1}{2}$% = .875.
$4.20 ÷ .875 = $4.80, m.p.

54. 100% − 25% = .75.
.875 ÷ .75 = $1.16$\frac{2}{3}$, m.pr.

55. 20% = $\frac{1}{5}$; $\frac{1}{5} + \frac{5}{5} = \frac{6}{5}$.
$60 × $\frac{6}{5}$ = $\frac{360}{5}$ = $72.
100% − 4% = .96.
$72 ÷ .96 = $75, m. price.

56. $4.50 × 1.15 = $5.175.
100% − 10% = .90.
$5.175 ÷ .90 = $5.75, m.p.

## QUESTIONS FOR REVIEW.

*Page 253.*

1. 65 lbs. × $0.23 = $14.95, cost.
$14.95 × 18% = $2.691, profit. *Ans.*

2. 16$\frac{2}{3}$% = $\frac{1}{6}$.
$3865 + $1583.62 = $5448.62, cost.
$5448.62 ÷ 6 = $908.10$\frac{1}{3}$.
$5448.62 + $908.10$\frac{1}{3}$ = $6356.72$\frac{1}{3}$, selling price.

*Page 253—Continued.*

3. $2847 × 1.225 = $3487.575, price of shawls.
$956 × .89 = $850.84, " gingham.
Rec'd for both, $4338.415 *Ans.*

4. 25% = ¼.
$125 − $37 = $88, cost.
$88 × ¼ = $22, loss.

5. 750 sh. × $100 = $75000.
1 + .03 + .0075 = 1.0375.
$75000 × 1.0375 =
$77812.50, cost.

6. 3 T. × 2000 lbs. = 6000 lbs.
6000 lbs. × $.15½ = $930.00
$930 × .035 = $32.55, com.
$930 − $32.55 = $897.45, net profit.

7. $6.25 − $4.50 = $1.75, profit.
$1.75 ÷ $4.50 = 38⅞%, profit.

8. 6¼ cts. − 4 cts. = 2¼ cts. on 1 spool.
2¼ cents ÷ 4 cents = 56¼%, profit.
144 × 1000 = 144000 sp'ls.
2¼ cts. × 144000 = $3240, profit.
*Ans.* 56¼%, and $3240, pr.

9. 1650 T. × $12 = $19800, cost.
825 T. × 20 = $16500, received.
$3300, loss.
$3300 ÷ $19800 = .16⅔ or 16⅔%, loss. *Ans.*

10. $96.915 ÷ $1863.75 = .052 or 5$\frac{2}{10}$%.
$1863.75 − $96.915 = $1766.835, net proceeds.

11. Since she sold it for ¾ of the cost, she lost ¼; and ¼ = .25, or 25% loss. (Art. 334.)
Or, the cost is 100% or ¼ of itself.
Now ¼ − ¾ = ¼, the loss.
¼ ÷ ¼ = ¼ = .25 or 25%, loss. (Art. 354.)

12. $2 ÷ 3 = .66⅔, cost per lb.
$3 ÷ 2 = $1.50, selling pr.
$1.50 − .66⅔ = .83⅓, prof.
.83⅓ ÷ .66⅔ = 1.25 or 125% profit.

13. $1860 ÷ 20% = $9300 c'st.
$9300 + $1860 = $11160, selling price.

14. $1.05 ÷ .15 = $7.00, cost.
$7 + $1.05 = $8.05, sel. p.

15. $0.25 ÷ .125 = $2, cost.
$2 — $.25 = $1.75, sell. pr.

*Page 254.*

16. $260 ÷ .05 = $5200, am't sales.
$5200 — $260 = $4940, net proceeds.

17. $60.00 ÷ .0025 = $24000, amount sold.

18 $1.25 ÷ 1.00 = $1.25, am't paid.

19. $33\frac{1}{3}\% = \frac{1}{3} + \frac{3}{3} = \frac{4}{3}$, sell. pr.
$7000 ÷ $\frac{4}{3}$ = $\frac{21000}{4}$ = $5250, cost.
$7000 — $5250 = $1750, profit.

20. $.9375 ÷ 1.1875 = $.7894\frac{14}{19}$, cost 1 gal.
$.9375 — $.7894 = $.1481 profit per gal.
$.7894 × 63 = $49.73, cost per hhd.
.1481 × 63 = $9.33, profit per hhd.
$0.9375 × 63 = $59.0625, selling price. Or,
The selling price = the cost plus $18\frac{3}{4}\%$ of itself. But the cost is 100% of itself, and $100\% + 18\frac{3}{4}\% = 118\frac{3}{4}\%$. The question now is, $59.0624 is $118\frac{3}{4}\%$ of what sum? (Arts. 341, 356.)
$59.0625 ÷ 1.1875 = $49.73, cost.
$59.0625 — $49.73 = $9.33, gain.

21. $25\% = \frac{1}{4}$, and $\frac{4}{4} + \frac{1}{4} = \frac{5}{4}$, or $1\frac{1}{4}$.
$12.50 ÷ $1\frac{1}{4}$ = $10, cost per bar. *Ans.*

22. $12\frac{1}{2}\% = \frac{1}{8}$, and $\frac{8}{8} + \frac{1}{8} = \frac{9}{8}$, or $1\frac{1}{8}$.
$57725 ÷ $1\frac{1}{8}$ = $51311\frac{1}{9}$, cost.
$57725 — $51311\frac{1}{9}$ = $6413\frac{8}{9}$, gain.

23. $100\% - 3\frac{1}{2}\% = .965$.
$15246 ÷ .965 = $15798.963, sales.
$15798.963 — 15246 = $552.963, commission.

24. $12\frac{1}{2}\% = \frac{1}{8}$, and $\frac{8}{8} + \frac{1}{8} = \frac{9}{8}$, or $1\frac{1}{8}$.
$650 ÷ $1\frac{1}{8}$ = $5.77\frac{7}{9}$, cost per ton.
$8 — $5.77\frac{7}{9}$ = $2.22\frac{2}{9}$, gain per ton.
$2.22\frac{2}{9} ÷ $5.77\frac{7}{9}$ = $38\frac{6}{13}\%$.

Or, 250 T. × $6\frac{1}{2}$ = $1625 s. pr.
1.125) 1625.000
$1444\frac{4}{9}$, cost.
250 × 8 = $2000, at $8 per ton.
$2000 — $1444\frac{4}{9}$ = $555\frac{5}{9}$, pro.
$555\frac{5}{9} ÷ $1444\frac{4}{9}$ = $38\frac{6}{13}\%$.

***Page 254—Continued.***

25. $18560 ÷ 1.15 = $16139.13, cost.
$16139.13 − $15225 = $914.13, loss.
$914.13 ÷ $16139.13 = $5\frac{66}{100}$%, loss. +

26. $40 × .20 = $8.00, profit.
$40 + $8 = $48, selling price.
1.00 − 20% = 80%.
$48 ÷ .80 = $60, mar. pr.

27. 1.00 + .25 = 1.25, m. pr.
1.25 × $\frac{1}{4}$ (25%) = .3125, abatement.
1.25 − .3125 = .9375, s. p.
1 − .9375 = .0625, $6\frac{1}{4}$% l's.
Or, the cost of the books is 100%, or $\frac{4}{4}$ of itself, and $\frac{4}{4} + \frac{1}{4} = \frac{5}{4}$, marked price; and
$\frac{1}{4}$ of $\frac{5}{4} = \frac{5}{16}$, abatement.
$\frac{5}{4}$ or $\frac{20}{16} - \frac{5}{16} = \frac{15}{16}$, sell. pr.
$\frac{16}{16} - \frac{15}{16} = \frac{1}{16}$, or $6\frac{1}{4}$% loss.

28. 20% = $\frac{1}{5}$.
$0.025 ÷ $\frac{1}{5}$ = $0.125, cost.
$0.125 + $0.025 = $0.15 a pound.

29. 2500 × $1$\frac{3}{4}$ = $4375, cost of wheat.
3200 × $.87$\frac{1}{2}$ = $2800, " corn.
4000 × $.25 = $1000, " oats.
$450, freight.

Whole cost, $8625

$4375 × 1.05 = $4593.75, wheat.
$2800 × .89 = $2492.00, corn.
$1000.00, oats.

Am't sales. $8085.75
$8085.75 × .05 = $404.29, commission.

Net receipts, $7681.46

$8625 − $7681.46 = $943.54, loss.

$8625)$943.54

Loss, $10\frac{9}{10}$% + *Ans.*

# INTEREST.

***Problem I. Page 258.***

1, 2. Given.

3. Int. $1 for 16 m. =.08.
Prin., $31.75
Int. $1 for time, .08
*Ans.* $2.5400

4. Int. $1 for 6 m. =.03
" " 24 d. =.004
Int. for 6 m. 24 d. =.034
$49.30 × .034 = $1.676.

5. Int. of $1 for 4 m. =.02
" " " 3 d. =.0005
Int. for 4 m. 3 d. =.0205
$51.19 × .0205 = $1.04939
$1.0493 × $\frac{1}{6}$ = .17489
Int. at 7% = $1.22428

6. Int. of $1 for 7 m. =.035
" " " 18 d. =.003
Int. for 7 m. 18 d. =.038
$142.83 × .038 = $5.427
$5.427 × $\frac{1}{6}$ = .904
Int. at 5% = $4.523

7. Int. of $1 for 11 m. =.055
" " " 21 d. =.0035
Int. for 11 m. 21 d. =.0585
$741.13 × .0585 = $43.356

8. Int. $1 for 22 m. =.11
" " 26 d. =.0043
Int. 1 y. 10 mo. 26 d. =.1143
$968.84 × .1143 = $110.77.

9. Int. $1 for 8 m. =.04
" " 29 d. =.00483
Int. for 8 m. 29 d =.04483
$639 × .04483 = $28.64637
$28.64637 × $\frac{1}{6}$ = 4.77439
Int. at 7% = $33.42076

10. Int. $1 for 7 m. =.035
" " 17 d. =.00283
Int. for 7 m. 17 d. =.03783
$741.13 × .03783 = $28.0369
$28.0369 × $\frac{1}{6}$ = 4.6728
Int. at 7% = $23.3641

11. Int. $1 for 3 m. =.015
" " 3 d. =.0005
Int. for 3 m. 3 d. =.0155
$1237.63 × .0155 = $19.183
$19.183 × $\frac{1}{3}$ = 6.394
Int. at 8% = $25.577

12. Int. $1 for 13 m. =.065
" " 25 d. =.00416
Int. 13 m. 25 d. =.06916
$2046.25 × .06916 = $141.52
$141.52 × $\frac{1}{3}$ = 47.17
Int. at 4% = $94.35+

***Page 258—Continued.***

13. Int. $1 for 1 m. =.005
" " 3 d. =.0005
Int. 1 m. 3 d. =.0055
$3256.07 × .0055 = $17.91.

14. Int. $1 for 9 m. =.045
" " 15 d. =.0025
Int. 9 m. 15 d. =.0475
$630.375 × .0475 = $29.943
$29.943 × ⅔ = 19.962
Int. at 10% = $49.905
Prin. = 630.375
Am't $680.280

15. Int. $1 for 13 m. =.065
" " 19 d. =.0031
Int. 13 m. 19 d. =.0681
$75.45 × .0681 = $5.138
$5.138 × ⅙ = .856
Int. at 7% = $5.994
Prin. = 75.45
Am't = $81.444

16. Int. $1 for 2 m. =.01
" " 3 d. =.0005
Int. 2 m. 3 d. =.0105
$2831.20 × .0105 = $29.728
$29.728 × ½ = 14.864
Int. at 9% = $44.592
Prin. = $2831.20
Am't = $2875.792

17. Int. $1 for 3 m. =.015
" " 11 d. =.00183
Int. 3 m. 11 d. = 01683
$356 81 × .01683 = $6.005
$6.005 × 1/12 = .500
Int. at 5½% = $5.505
Prin. = $356 81
Am't = $362 315

18. Int. $1 for 4 m. =.02
" " 3 d. =.0005
Int. for 4 m. 3 d. =.0205
$2700 × .0205 = $55.35
$55.35 × 1/12 = 4.612
Int. at 6½% = $59.962
Prin. = 2700.00
Am't = $2759.962

19. Int. $1 for 33 d. =.0055.
$5000 × .0055 = $27.50
$27.50 × ⅙ = 4.583
Int. at 7% = $32.083
Prin. = 5000.00
Am't = $5032.083

20. Int. $1 for 2 m. =.01
" " 17 d. =.0028
Int. 2 m. 17 d. =.0128
$12720 × .01283 = $163.198
$163.198 × ¼ = 40.799
Int. at 4½% = $122.399

NOTE.—4½% is 1½% less than 6%. Now 1½ is ¼ of 6. Hence, in finding 4½%, we subtract ¼ of the interest at 6% from itself.

21. Int. $1 for 4 m. =.02
" " 23 d. =.0038
Int. 4 m. 23 d. =.0238
$221.42 × .0238 = $5.269
Prin. =$221.42
Am't =$226.69

22. $563.16 × .08 = $45.053.

23. Int. $1 for 3 m. at 1% = .03.
$7216.31 × .03 = $216.489.

24. Int. $1 for 2 m. a. 2½% =.05.
$9864 × .05 = $493.20.

25. Int. $1 for 17 m. =.085
" " 10 d. =.0016
Int. 17 m. 10 d. =.08666
$3540 × .08666 = $306.776
$306.776 × ¼ = 76.694
Int. at 7½% =$383.470
Prin. =$3540.000
Am't =$3923.470
(See note, Ex. 20.)

26. Given.

27.

| | y. | m. | d. |
|---|---|---|---|
| | 1868 | 10 | 3 |
| | 1867 | 7 | 4 |
| Time, | 1 | 2 | 29 |

Int. $1 for 14 m. =.07
" " 29 d. =.00483
Int. 1 y. 2 m. 29 d. =.07483
$1145 × .07483 =$85.68
$85.68 × ⅙ = 14.28
Int. at 7% =$99.96

28.

| | y. | m. | d. |
|---|---|---|---|
| | 1862 | 3 | 25 |
| | 1861 | 5 | 21 |
| Time, | | 10 | 4 |

Int. $1 for 10 m. =.05
" " 4 d. =.0006⅔
Int. 10 m. 4 d. =.05066
$568.45 × .05066 = $28.80
$28.80 × ⅙ = 4.80
Int. at 5% =$24.00

29.

| | y. | m. | d. |
|---|---|---|---|
| | 1871 | 12 | 18 |
| | 1871 | 1 | 21 |
| Time, | | 10 | 27 |

Int. $1 for 10 m. =.05
" " 27 d. =.0045
Int. 10 m. 27 d. =.0545
$2576.81 × .0545 = $140.436
$140.436 × ⅙ = 23.406
Int. at 7% = $163.842
Prin. =$2576.81
Am't =$2740.652

## *Page 259.*

2. $143.21, principal.
.07, rate.
12)10.0247, int. 1 yr.
2
20.0494 " 2 yrs.
30) .8354 " 1 m.
3.3416 " 4 m.
.0278 " 1 d.
.1946 " 7 d.
$24.4488. *Ans.*

NOTE.—1 m. + 4 m. = 5 m.; also 1 d. + 7 d. = 8 d. (Key, p. 47, N.)

3. Prin. $76.10
Rate .065

12)4.9465 int. 1 yr.
6) .4122 " 1 m.
.8244 " 2 m.
.0687 " 5 d.

Int., $6.2518 *Ans.*

***Page 260.***

4. $95.31 prin.
.07 rate.

12)6.6717 int. 1 yr.
30) .5559 " 1 m.
3.8913 " 7 m.
.0185 " 1 d.
.3520 " 19 d.

Int., $4.8177 *Ans.*

5. $110.43 prin.
.04 rate.

2)4.4172 int. 1 yr.
2.2086 " 6 m.
.1227 " 10 d.

Int., $6.7485 *Ans.*

6. $258 prin.
.08 rate.

$20.64 int. 1 yr.
3

$61.92 " 3 yr.
12.04 " 7 m.

Int., $73.96 *Ans.*

7. $205.38 prin.
.0625 rate.

$12.83625 int. 1 yr.
5

Int., $64.18125 *Ans.*

8. $361.17 prin.
.08 rate.

12)28.8936 int. 1 yr.
2.4078 " 1 m.

Int., $26.4858 *Ans.*

9. $416.84 prin.
.07½ rate.

12)31.2630 int. 1 yr.
30)2.60525 " 1 m.
.08684 " 1 d.
19 d.

Int., $1.65 *Ans.*

10. $385.20 prin.
.075 rate.

12)28.890 int. 1 yr.
30)2.4075 " 1 m.
.08025 " 1 d.
.96300 " 12 d.
28.890 " 1 yr.

Int., $29.93325 *Ans.*

11. $1000 prin.
.055 rate.

12)55.000 int. 1 yr.
10) 4.583 " 1 m.
.4583 " 3 d.

Int., $60.0413 *Ans.*

12. $1525.75 prin.
.08 rate.

4)122.06 int. 1 yr.
Int., $30.515 *Ans.*

13. $12254 prin.
.08 rate.

980.32 int. 1 yr.
2½

Int., $2450.80 *Ans.*

14. $20165 prin.
.07 rate.

12)1411.55 int. 1 yr.
30) 117.629 " 1 m.
5

588.145 " 5 m.
3.9209 " 1 d.
62.7344 " 16 d.

$654.8003 int.
$20165. prin.

Am't, $20819.8003 *Ans.*

## *Page 261.*

1, 2. Given.

3. $517 prin.
33 days.

6|000)17|061
*Ans.* $2.8435 int.

4. $208.75 prin.
63 days.

6|000)13|151.25
*Ans.* 2.192 + int.

5. $631.15 prin.
93 days.

6000)58696.95
6)9.78282 int. at 6%.
1.63047 " " 1%.
*Ans.* $11.41329 " " 7%.

6. $1000 prin.
100 days.

6|000)100|000
6)16.666 int. at 6%.
minus 2.777 " " 1%.
*Ans.* $13.889 " " 5%.

7. $1260.13 prin.
120 days.

6000)$151215.60
$25.2026 int. at 6%.
$1260.13 prin.
*Ans.* $1285.3326 Am't.

8. $3568.17 prin.
20 days.

6000)71363.40
6)11.8939 int. at 6%.
1.9823 " " 1%.
*Ans.* $13.8762 " " 7%.

9. $4360.50 prin.
3 days.

6000)13081.50
6)2.18025 int. at 6%.
.36337 " " 1%.
$2.54362 " " 7%.
$4360.50 prin.
*Ans.* $4363.04362 Am't.

10. May 31 − 21 = 10 d.
June 30
July 31
Aug. 31
Sep. 30
Oct. 5
137 d.

137 d.
5000
6|000)685|000
*Ans.* $114.166

11. From Aug. 12th to Jan. 5th = 146 d.
$6523
146
6000)$952358
6)158.726 int. at 6%.
26.454 " " 1%.
*Ans.* $185.180 " " 7%.

12. From Jan. 5th to March 10th = 65 d.
$7510
65
6|000)488|150
*Ans.* $81.358 int.

***Problem II. Page 262.***

1. Given.

2. $600 prin.
.01 rate.
4)6.00 int. 1 y.
$1.50 " 3. m.
$1.50)$10.50
7%. *Ans.*

3. $1500 prin.
.01 rate.
2)$15.00 int. 1 y.
$7.50 " 6 m.
$7.50)$52.50
7%. *Ans.*

4. $1000 × .01 = $10.00, 1 y.
$10.00 × 3⅓ y. = $33.333.
$200 ÷ 33.33⅓ = 6%. *Ans.*

5. 21 y. − 14 y. = 7 y.
$7800 − $5000 = $2800, the given int.
$5000 prin.
.01 rate.
50.00 int. 1 y.
7
$350.00 " 7 y.
$350)2800
8%. *Ans.*

6. $9600 × .01 = $96.00, 1 y.
$870 ÷ $96 = 9 1/16 %. *Ans.*

7. $500 × .01 = $5.00 1 y.
$5.00 × 12 = $60, int. 12 y.
$500 ÷ $60 = 8⅓%. *Ans.*

8. $1000 × .01 = $10.00,
int. 1 yr.
$10 × 20 y. = $200,
int. 20 y.
$1000 ÷ 200 = 5% for 20 y.
$10 × 10 y. = $100,
int. 10 y.
$1000 ÷ 100 = 10% for 10 y.

9. $1250 × .01 = $12.50,
int. 1 y.
$12.50 × 14⅔ = $178.5715
$1250 ÷ 178.5715 = 7%.

10. $3000 × .01 = $30.00,
int. 1 y.
$30 × 16⅔ y. = $500,
int. 16⅔ y.
$3000 ÷ 500 = 6%. *Ans.*

***Problem III. Page 263.***

1, 2. Given.

3. $1250 × .07 = $87.50,
int. 1 y.
$500 ÷ 87.50 = 5⅝ y., or 5 y. 8 m. 17 d. *Ans.*

4. $2200 ÷ .06 = $132,
int. 1 y.
$100 ÷ $132 = .7575 y.
.7575 y. = 9 m. 2 d. *Ans.*

5. $10000 × .08 = $800,
int. 1 y.
$200 ÷ $800 = .25 y.,
or 3 m. *Ans.*

6. Given.

7. $1200 × .07 = $84,
int. 1 yr.
$1200 ÷ $84 = 14⅐ yr., or 14 y. 3 m. 12.8 d. *Ans.*

8. $15000 − $7500 = $7500,
the given int.
$7500 × .06 = $450,
int. 1 y.
$7500 ÷ $450 = 16⅔ y., or 16 y. 8 m.

9. $25000 − 10000 = 15000,
the given int.
$10000 × .08 = $800,
int. 1 y.
$15000 ÷ $800 = 18.75 y.
or, 18 y. 9 m. *Ans.*

***Problem IV. Page 264.***

1. Given.

2. Int. $1 for 1 y. = .06.
$100 ÷ .06 = $1666⅔.

3. Int. $1 for 6 m. = .035.
$105 ÷ .035 = $3000.

4. Int. $1 for 1 y. 6 m. = .075.
$175 ÷ .075 = $2333.33⅓.

5. Int. $1 for 1 y. = .06.
$150 ÷ .06 = $2500. *Ans.*

6. Int. $1 for time = .07.
$2800 ÷ .07 = $40000.

7. Int. $1 for time = .03.
$300 ÷ .03 = $10000.

8. Int. $1 for time = .06.
$1500 ÷ .06 = $25000.

***Problem V.***

1. Given.
2. $235.849.
3. $327.356.
4. $8928.57.
5. $892.857.
6. $5582.142.

***Page 266.***

2. Principal, $1000.00
   Int. 4 yrs., 280.00
   " $70, 3 yrs., 14.70
   " 70, 2 yrs., 9.80
   " 70, 1 yr., 4.90
   Amount, $1309.40

# PARTIAL PAYMENTS.

***Page 268.***

1. Given.

2. Principal dated July 1st, 1869, $1500.00
   Int. to 1st payt., Jan. 5th, 1870 (6 m. 4 d.), 53.67
   *Amount*, = 1553.67
   1st payment, Jan. 5th, 1870, 68.50
   Remainder or new principal, 1485.17
   Int. from 1st payment to Aug. 8th, 1870 (7 m. 3 d.), 61.52
   2d payment, less than int. due, $20.10
   Int. on same prin. to Feb. 11th, 1871 (6 m. 3 d.), 52.85
   *Amount*, = 1599.54
   3d payment, to be added to 2d, $100.00 120.10
   Remainder or new principal, = 1479.44
   Int. to July 1st, 1871 (4 m. 20 d.), 40.27
   *Balance* due July 1st, 1871, = $1519.71

3. Principal dated March 5th, 1860, $930.00
   Int. to 1st payment, Oct. 10th, 1860 (7 m. 5 d.), 44.43
   *Amount*, = $974.43
   1st payment, less than int. due, $20.00
   Int. on same prin. to Nov. 16th, 1861 (1 y. 1 m. 6 d.), 81.84
   *Amount*, = 1056.27
   2d payment, to be added to 1st, 250.13 270.13
   Remainder or new principal, = 786.14
   Int. to 3d payment, June 20th, 1862 (7 m. 4. d), 37.38
   *Amount*, 823.52
   3d payment, June 20th, 1862, 310.00
   Remainder or new principal, = 513.52
   Int. to Jan. 30th, 1863 (7 m. 10 d ), 25.11
   *Balance* due Jan. 30th, 1863, = $538.63

## MERCANTILE METHOD.

*Page 269.*

4. Given.

5. Principal, dated Jan. 1st, 1868, $650.00
Int. to settlement, Dec. 31st, 1868 (364 d.), 39.43

*Amount* Dec. 31, 1868, = $689.43

| | | | | | |
|---|---|---|---|---|---|
| 1st payment, | $125. | Time, | 204 d. | Am't | = $129.25 |
| 2d payment, | 75.50. | " | 109 d. | " | = 76.87 |
| 3d payment, | 210.00. | " | 89 d. | " | = 213.12 |

*Amount* of payments, = 419.24

*Balance* due Dec. 31st, 1868, = $270.19

6. Principal, dated July 5th, 1865, $820.00
Int. 1 yr., at 7%, 57.40

*Amount* July 5th, 1866, = 877.40

| | | | | | |
|---|---|---|---|---|---|
| 1st payment, | $150.00. | Time, | 176 d. | Am't, | $155.13 |
| 2d " | 73.10. | " | 107 d. | " | 74.62 |
| 3d " | 116.00. | " | 61 d. | " | 117.37 |
| 4th " | 141.50. | " | 20 d. | " | 142.05 |

*Amount* of payments, = 489.17

*Balance* due July 5th, 1866, = $388.23

7. Principal, dated March 3d, $1100.00
Int. 299 d., 7%, 63.95

*Amount* Dec. 27th, $1163.95

| | | | | | |
|---|---|---|---|---|---|
| 1st payment, | $310. | Time, | 209 d. | Am't, | $322.59 |
| 2d " | 119. | " | 142 d. | " | 122.28 |
| 3d " | 200. | " | 71 d. | " | 202.76 |

*Amount* of payments, 647.63

*Balance* due Dec. 27th, = $516.32

# COMPOUND INTEREST.

## *Page 273.*

1. Given.

2. Principal, $500.00
Int. for 1st year, 500 × .07 = 35.00
*Amount* for 1 year or 2d prin. = 535.00
Int. for 2d year, 535 × .07 37.45
*Amount* for 2d year or 3d prin. = 572.45
Int. for 3d year, 572.45 × .07 40.07
*Amount* for 3 years, =$612.52
Principal to be subtracted, 500.00
*Compound interest* for 3 years, $112.52

3. Principal, $750.00
Int. 1 year, 750 × .05, 37.50
*Amount* for 1 year, = 787.50
Int. 2d year, 787.50 × .05, 39.38
*Amount* for 2d year = 826.88
Int. 3d year, 826.88 × .05, 41.34
*Amount* for 3d year = 868.22
Int. 4th year, 868.22 × .05, 43.41
*Amount* for 4 years, 911.63
Principal to be subtracted, 750.00
*Compound interest* for 4 years =$161.63

## *Page 274.*

4. Principal, $1000.00
Int. 1 year, 1000 × .06, 60.00
*Amount* for 1 year = 1060.00
Int. 2 years, 1060 × .06, 63.60
*Amount* for 2 yrs. = 1123.60
Int. 7 m. 9 d., 1123.60 × .0365, 41.01
*Amount* for 2 yrs. 7 m. 9 d. =$1164.61
Principal to be subtracted, 1000.00
*Compound int.* for 2 yrs. 7 m. 9 d. = $164.61

5. Principal, $1360.00
Int. 6 m., 1360 × .035, 47.60
*Amount* for 6 m. = $1407.60
Int. 2d period, 1407.60 × .035, 49.266
*Amount* for 1 year, $1456.866
Int. 3d period, 1456.866 × .035, 50.990
*Amount* for 1 yr. 6 m., $1507.856
Int. 4th period, 1507.856 × .035, 52.775
*Amount* for 2 years, $1560.631
Principal to be subtracted, 1360.00
*Compound interest* for 2 years, $200.63

6. Principal, $2000.00
Int. 1st quarter, 2000 × .01, 20.00
*Amount* for 1st quarter, $2020.00
Int. 2d quarter, 2020 × .01, 20.20
*Amount* for 2d quarter, $2040.20
Int. 3d quarter, 2040.20 × .01, 20.402
*Amount* for 3d quarter, $2060.602
Int. 4th quarter, 2060.602 × .01, 20.606
*Amount* for 4th quarter, or 1 yr., $2081.208
Int. 5th quarter, 2081.208 × .01, 20.812
*Amount* for 5th quarter, $2102.020
Int. 6th quarter, 2102.02 × .01, 21.020
*Amount* for 6th quarter, $2123.040
Int. 7th quarter, 2123.04 × .01, 21.23
*Amount* for 7th quarter, $2144.27
Int. 8th quarter, 2144.27 × .01, 21.443
*Amount* for 2 years, $2165.713

## *Page 275.*

7. Given.

8. 1.689479 × $800 = 1351.583200.
1351.583200 − $800 = $551.58. *Ans.*

9. 2.25219 × $1100 = 2477.40900.
2477.40900 − $1100 = $1377.41. *Ans.*

10. 2.182875 × $1305 = 2848.651875.
2848.651875 − $1305 = $1543.65. *Ans.*

11. Am't $1 for 15 y., 1.800944 × 4500 = $8104.248. *Ans.*

12. Am't $1 for 25 y., 5.42743 × 6000 = $32564.58. *Ans.*

13. Am't $1 for 15 y., 2.396558 × 3800 = 9106.9204.
2.396558 × 9106.9204 = $21825.262, Am't for 30 y. *Ans.*

14. Am't $1 for 20 y., 2.653298 × 4240 = 11249.984.
2.653298 × 11249.984 = $29849.56, Am't for 40 y. *Ans.*

15. Am't $1 for 25 y., 5.42743 × 1280 = 6947.1104.
5.42743 × 6947.1104 = $37704.953, Am't for 50 y. *Ans.*

16. Am't $1 for 20 y., 3.207135 × 100 = 320.7135.
3.207135 × 320.7135 = 1028.571, Am't for 40 y.
3.207135 × 1028.571 = $3298.766, Am't for 60 y. *Ans.*

## DISCOUNT.

### *Page 276.*

NOTE.—Days of grace are not supposed to be added to the given time in the examples under Arts. 398, 399.

1. Given.

2. $1.583 = Am't $1 for 10 m. at 7%.
1.0583)$300.00($283.47 +

### *Page 277.*

3. $1.08 = Am't $1 for 1 y. at 8%.
1.08)500.00($462.96

4. $1.03 = Am't $1 for 6 m. at 6%.
1.03)$1250.00($1213.59

5. $1.07 = Am't $1 for 1 y. at 7%.
1.07)$2500.00($2336.45

6. $1.12 = Am't $1 for 2 y. at 6%.
1.12)$5000.00($4464.285

7. Given.

8. $1.035 = Am't $1 for 7 m. at 6%.
1.035)2560.00($2473.43, present worth.
2560.00 − 2473.43 = $86.57.

9. $2819.00 ÷ 1.0375 = $2717.108.
$2819.00 − $2717.108 = $101.892. *Ans.*

10. $2375 ÷ 1.04 = $2283.65, present worth.
$2375 − $2283.65 = $91.35. *Ans.*

11. 3860 ÷ 2 = 1930.
$1930 ÷ 1.015 = $1901.478, due in 3 months.
$1930 ÷ 1.03 = $1873.786, " 6 "
The sum = $3775.264, present worth. *Ans.*

12. $6000 × .06 = $360 = int. 1 yr.
$6000 ÷ 1.06 = $5660.377, present worth.
$6000 − $5660.377 = $339.623, discount.
$360 − $339.623 = $20.377. *Ans.*

13. $1.105 = Am't $1 for 1½ yr., at 7%.
$5560 ÷ 1.105 = $5031.67, present worth.
$5560 − $5031.67 = $528.33. *Ans.*

14. $16080 ÷ 1.07 = $14953.27, present worth.
$15000 − $14953.27 = $46.73, the former.

## BANK DISCOUNT.

*Page 279.*

1, 2. Given.

3. $.0155 = int. $1 for 3 m. 3 d.
$730 × .0155 = $11.315, d.
$730 − $11.315 = $718.685

4. Int. $1000 at 6% for 63 days = $10.50.
$1000 − $10.50 = $989.50.

5. Maturity, 6 m. 3 d., or Nov. 4th.

| | |
|---|---|
| In Aug., | 10 d. |
| " Sept., | 30 d. |
| " Oct., | 31 d. |
| Nov. | 4 |
| | 75 d., term dis. |

$1740 × 75 = 130500.
6|000)130|500
6)$21.750 int. at 6%.
3.625 " " 1%.
$18.125 " " 5%.
$1740 − $18.125 =
$1721.875, proceeds.

6. $5000 × .0605 = $302.50, bank discount.
$1.0605)$5000.00
Pr. w'th, 4714.75
$5000 − $4714.75 = $285.25
Dif. $17.25

NOTE.—This answer is based on the supposition that 3 days' grace are allowed both on the True and Bank Discount. If allowed on the latter only, the Ans is $19.48.

7. $7500, cost.
$7500 × .12½ = $937.50, profit.
$7500 + $937.50 = $8437.50, note.
$201.80 = discount.
$8437.50 − $201.80 = $8235.70, net pr.
Subt. $7500.00
Prof. = $735.70 *Ans.*

9. $.976 = proceeds $1 for 4 m. 3 d., 7%.
$750 ÷ .976 = $768.44 +.

10. $.00875 = 5% int. $1,63 d.
$1.00 − .00875 = .99125, proceeds of $1.
$1565 ÷ .99125 = $1578.81.

11. $.9727 = proceeds $1 for 4 m. 3 d., 8%.
$2165.45 ÷ .9727 = $2226.23. *Ans.*

12. $.9795 proceeds $1, at 6%, 4 m. 3 d.
$7350 ÷ .9795 = $7503.83.

## STOCKS AND BONDS.

***Page 282.***

1. Given.
2. $2700 × .09 = $243. *Ans.*
3. $3000 × .17½ = $525.
4. $3500 × .15 = $525.
5. $4000 × .10 = $400.
6. $2800 × .17 = $476.
7. Given.
8. $14000 × .92 ÷ $12880.

***Page 283.***

9. $9500 × 1.10½ = $10497.50. *Ans.*

10. 5800 × 1.10 = $6380.00 market value.
5800
.0025 = $14.50, brokerage.
1.89, charges. 16.39 am't of ch.
Net value, $6363.61 *Ans.*

11. $7500 × .85 = $6375.00 market value.
7500
.005 = $37.50, brokerage.
1.39, charges. 38.89 am't of ch.
Net value, $6336.11 *Ans.*

12. $10000 × 1.0825 = $10825.00 market value.
$10000 × .0025 = 25.00 brokerage.
Other expenses = 2.37½
Cost = $10852.37½ *Ans.*

13. $15750 × 1.22½ = $19293.75. *Ans.*

14. $10000 × .06 = $600, int. in gold.
$600 × 1.12 = $672. *Ans.*

16. $750.00 ÷ $5000 = 15%.

17. $625 ÷ $10000 = .0625, or 6¼%. *Ans.*

18. $35000 − $3000 = $32000
$32000.00 ÷ $480000 = 6⅔%. *Ans.*

***Page 284.***

20. $4200.00 ÷ 1.05 = $4000 worth or 40 bonds.

21. $10800 ÷ .90 = $12000.

22. Given.

23. $2500 ÷ .06 = $41666⅔, nominal value.
$41666⅔ × 1.06 = $44166⅔. *Ans.*
PROOF. — $2500 gold = $2650 currency.
$44166⅔ × .06 = $2650, or $2500 gold.

24. $35625.

25. $4200.00 ÷ .06 = 70000, nominal value.
$70000 × .80 = $56000.

## DOMESTIC EXCHANGE.

***Page 287.***

1. Given.

2. $1 + 3½% = $1.035
Dis. $1, 63 d. = .0105
Cost $1 exc. = $1.0245
Face of d'ft, 2000
*Ans.* $2049.0000

3. $3560 face d'ft.
.98 cost $1.
$3488.80 *Ans.*

4. Discount on $1 = .01
Int. $1 for 93 d. = .018083
Am't of both = .028083
$1 − .028083 = $.971917, cost of $1 draft.
$4250 × .971917 = $4130.647+. *Ans.*

5. $5000 × .04 = $200 face d.
$1 at 1½% = 1.015
*Ans.* $203.000

7. Given.

8. $1 dft. cost $1.025.
$1250 ÷ $1.025 =
$1219.51. *Ans.*

*Page 288.*

9. $1 + 2% = $1.020
Dis. 8%, 63 d. = .014
Cost of $1 dft. = $1.006
$1500 ÷ 1.006 = $1491.053.

10. $1 − 4½% = $0.955.
$2500 ÷ .955 = $2617.801

11. Discount = .02
Int. 4 m. 3 d. = .0205
$1 − .0405 =
$.9595, cost of $1 draft.
$3600 ÷ .9595 = $3751.95.

12. $3806 ÷ 1.015 = $3750.

## FOREIGN EXCHANGE.

*Page 289.*

1, 2. Given.

3. $4.87⅞ = $4.87875
Face of bill = £381
*Ans.* $1858.80⅜

4. Value of £1 = $4.8665
Bill = £750
Cost, $3649.8750
Gold premium, .33⅓
Currency, $4866.50

5. Value of £1 = $4.93375
Bill = £1500
Cost of bill, $7400.625
$4.80 × 1500 = $7200
$7200 × .02 = $144
Cost of gold = 7344
$7400.625, cost of bill.
7344.000, " " gold.
$56.625, bal. in favor of gold.

6. 568 bales of 450 lbs. each = 255600 pounds cotton.
255600 lbs., at 12d. = 3067200d.
3067200d. ÷ 240 (12 × 20) = am't of sales = £12780.00.
Amount of sales, £12780
Per cent commission = .02¼
Commission = £287.55
Freight at 1d. per pound = £1065.00
Storage = £8.30 Exp. = £1360.85
Net proceeds = £11419.15
The market value of £1 at $4.91½ = $4.915
*Ans.* $56125.1222

8. $4.885)$2500.00
Face of bill, £511.77
£.77=15s. 4d. 3.2 far.
*Ans.* £511, 15s. 4d. 3.2 far.

9. $4.8425)$3750.00
Am't of exch., £774.393
£.393 × 20 × 12 × 4=
7s. 10d. 1.28 far.
*Ans.* £774, 7s. 10d. 1.28 f.

10. $4.87⅛ to the £ =
$4.87125.
$4.87125)$5000.00
£1026.43
*Ans.* £1026, 8s. 7.2d.

11. $4.862)$7500.00
£1542.575
*Ans.* £1542, 11s. 6d.

*Page 291.*

13. 3500 fr. ÷ 5.18=$675.68.

15. 5.22 fr. to $1 ex.
$2500 paid.
13050.00 fr. *Ans.*

16. 5.23 fr. to $1 ex.
$3150 paid.
16474.50 fr. *Ans.*

# INSURANCE.

*Page 293.*

2. $1900 × .0035=$6.65.
3. $2560 × .015=$38.40.
4. $3750 × .0225=$84.375.
5. $4280 ÷ .0025=$10.70.
6. $5000 × .0050=$25.00.
7. $6175 × .03⅓=$197.60.
8. $35000 × .025=$875.
9. $48250 + .03¼=$1568.125
$1568.125 + $1.50 =
$1569.625. *Ans.*

*Page 294.*

11. 100%—3%=.97.
$15275 ÷ .97 =
$15747.423.

12. 100%—2%=.98.
$27250 ÷ .98 =
$27806.122+.

13. 100%—5%=.95.
$35250 × .95 =
$37105.263+.

## LIFE INSURANCE.

2. $2500 × .05=$125.00.
3. $7500 × .03¼=$243.75.
$243.75 × 10 y.=$2437.50.
4. $8000 × .12½ = $1000 per annum.
$1000 × 5 y.=$5000. *Ans.*

5. 70 yrs.—30 yrs.=40 yrs.
$75000 × .04 = $3000 per year. $3000 × 40=
$120000, payments.
$75000, receipts.
$45000, excess of pay'ts.

# TAXES.

### *Page 295.*

1. $250000 = valuation.
   $6250 ÷ $250000 = 2½%, rate.
   30000 × .025 = $750.00, A's tax.
   37850 × .025 = $946.25, B's "
   40150 × .025 = $1003.75, C's "
   50000 × .025 = $1250.00, D's "
   55000 × .025 = $1375.00, E's "
   37000 × .025 = $925.00, F's "

2. Given.

### *Page 297.*

3. By Table, C's valuation = $40150.
   Tax on $40000 = $1000.00
   " 100 = 2.50
   " 50 = 1.25
   Therefore, we have C's tax = $1003.75

   D's valuation = $50000 = $40000 + $10000
   Tax on $40000 = $1000
   " 10000 = 250
   Therefore, D's tax = $1250

   E's valuation = $55000.
   Tax on $40000 = $1000
   " 10000 = 250
   " 5000 = 125
   Therefore, E's tax = $1375

   F's valuation = $37000.
   Tax on $30000 = $750
   " 4000 = 100
   " 3000 = 75
   Therefore, F's tax = $925

   By rule. (See Example 1, above.)

4. Tax levied =$16020
260 p's, at $1.25= 325
Sum to be raised=$15695
$784750)15695.00
Rate of tax = .02
$7800 × .02 =$156.00
3 polls, at $1.25= 3.75
A's tax =$159.75

5. Tax levied =$165945
1260 polls × .75= 945
Tax to be raised=$165000
Real estate =$5427600
Pers'al " = 72400
Valuation =$5500000
$5500000)165000.00
Rate= .03
G's tax = $15000 × .03=
$450. *Ans.*

6. $10250 × .03 =$307.50
.75 × 3 polls = 2.25
H's tax =$309.75

7. $50000)2500.00
Rate= .05
A's tax = $3400 × .05 =
$170. *Ans.*

8. Given.

9. 1 − .04 = .96.
$3500 ÷ .96 = $3645.83⅓.

10. $52600 ÷ .955 =
$5507.853+.

11. $10500 ÷ .95 =
$11052.63+.

# DUTIES.

***Problem I. Page 299.***

1. Given.

2. 50 y. × 65 p. = 3250 y.
Duty per yard =$1.25
*Ans.* $4062.50

3. 63 gal. × 87 = 5481.00 gal.
5481 g. × .03= 164.43 lea.
Quant'y tax= 5316.57 gal.
Duty per gal. $.20
*Ans.* $1063.3140

4. 68 lbs. × 500 =34000 lbs.
34000 p. × .02= 680 lbs.
Taxable, 33320 lbs.
Duty per lb., $.06
*Ans.* $1999.20

***Problem II.***

5. Given.

6. $1.80 × 1575 = $2835.
$2835 × .33⅓ = $945. *Ans.*

7. 67 lbs. × 110 = 7370 lbs.
9 lbs. × 110 chests = 990 lbs. tare.
Taxable, 6380 lbs.
.90
Invoice, $5742.00
$5742 × .40 = $2296.80. *Ans.*

## INTERNAL REVENUE.

***Page 300.***

1. Given.

2. Income, $4750
Ex. $1185 + $1200 = $2385
Taxable, $2365
Rate, .05
Rev. tax, $118.25

3. Income, $10500
Exemption, $2100
Paxable, $8400
Rate, .05
Income tax, $420.00
Pl., 35 × .05 = 1.75
Carriage, 2.00
Watch, 2.00 $5.75
Amount, $425.75

## EQUATION OF PAYMENTS.

***Problem I. Page 302.***

2. Half $1500 × 0 = 0000
Third $1000 × 6 = 6000
$500 × 12 = 6000
$3000 ) 12000
Av. time 4 m.
J. 20th + 4 m. = Oct. 20th.

3. $700 × 4 = $2800
500 × 6 = 3000
800 × 10 = 8000
1000 × 12 = 12000
3|000 ) $25|800
8.6 month.
8.6 m. = 8 m. 18 d. *Ans.*

4. $500 × 0 = 0000
750 × 10 = 7500
600 × 20 = 12000
400 × 30 = 12000
250 × 40 = 10000
$25|00 ) 415|00 d.
Average time, 16.6 d.
M. 10th + 17d. = M. 27th.

5. $12000 ÷ 4 = $3000, ⅓ of b.
$3000 × 0 = 0000
3000 × 2 = 6000
3000 × 4 = 12000
3000 × 6 = 18000
12000 ) 36000 m.
June 1st, or in 3 mo. *Ans.*

### *Problem II. Page 303.*

6, 7. Given.

8. Jan. 15th + 6 m. = July 15th.

| | | |
|---|---|---|
| July | 15th, | $210.00 × 00 = 0000.00 |
| Aug. | 11th, | $167.00 × 27 = 4509.00 |
| Sept. | 7th, | $320.25 × 54 = 17293.50 |
| Oct. | 2d, | $500.10 × 79 = 39507.90 |
| Items, | | 1197.35 )61310.40 prods. |
| Average time = | | 51.21 d. |

July 15th + 51 d. = Sept. 4th. *Ans.*

9.

| | | |
|---|---|---|
| Oct. | 5th, | $125.00 × 00 = 00 |
| Oct. | 21st, | $230.45 × 16 = 3687.20 |
| Nov. | 12th, | $267.00 × 38 = 10146.00 |
| Dec. | 2d, | $860.80 × 58 = 49926.40 |
| Sum of items, | | $1483.25 )63759.60 prods. |
| Average time, | | 42.9 days. |

Amount of note, $1483.25.
Date " Oct. 5th. } *Ans.*
Due in 42.9 days, or Nov. 17th.

## AVERAGING ACCOUNTS.

### *Page 306.*

1–3. Given.

4. In this example, we perceive that partial payments are made before they are due. Hence, by Note 3, we multiply each payment by the time from its date to the maturity of the debt. The debt $4220 is due in 8 m., but in 2 m. a payment is made. Hence, 8 − 2 = 6 m., the first multiplier, or,

| | | | | |
|---|---|---|---|---|
| 1st pay't, | $720 × 6 = | $4320 | | |
| 2d " | 850 × 5 = | 4250 | Debit, | $4220 |
| 3d " | 1000 × 3 = | 3000 | Credit, | 2570 |
| Sum pay't, | $2570 | $11570 prod's. | Bal., | $1650 |

1650)11570(7 months extension. *Ans.*

5. Dr. March 10th, 00 × $250 = 00000
June 14th, 96 × 420 = 40320
July 20th, 132 × 600 = 79200
Sum of items, $1270 119520, sum of prod's.

Cr. April 1st, 22 × $110 = 2420
June 23d, 105 × 300 = 31500
July 1st, 113 × 560 = 63280
Sum of items, $970 97200 prods.
Dr. $1270 119520, sum of products.
Cr. 970 97200, " "
Bal., $300 )22320, balance of products.
Average time, 74 d.

Bal. $300, due Mar. 10th + 74 d, or May 23d. *Ans.*

# RATIO.

***Page 309.***

1. $12 : 4 = \frac{12}{4}$, or 3.
2. $28 : 7 = \frac{28}{7}$, or 4.
3. $36 : 12 = \frac{36}{12}$, or 3.
4. $6 : 24 = \frac{6}{24}$.
5. $8 : 40 = \frac{8}{40}$.
6. $9 : 51 = \frac{9}{51}$.
7. £5 10s. 6d. = 1200d. : 126d., or $\frac{1200}{126} = 9\frac{66}{126}$. *Ans.*
8. 10 yd. : 6 ft. 3 in. = 360 in. : 75 in., or $\frac{360}{75} = 4\frac{60}{75}$. *Ans.*
9. 25 g. = 200 pt.
2 qt. 1 pt. = 5 pt.
$200 : 5 = \frac{200}{5}$, or 40. *Ans.*
11. $154 : 28 = \frac{154}{28} = \frac{11}{2}$,
or 11 : 2. *Ans.*
12. $39 : 165 = \frac{39}{165}$, or $\frac{13}{55}$.
13. $73 : 511 = \frac{73}{511}$, or $\frac{1}{7}$.
14. $113 : 1017 = \frac{113}{1017}$, or $\frac{1}{9}$.
15. $238 : 1428 = \frac{238}{1428}$, or $\frac{1}{6}$.
16. $576 : 1728 = \frac{576}{1728}$, or $\frac{1}{3}$.
19. $\frac{5}{8} \times \frac{4}{10} \times \frac{7}{9} = \frac{7}{36}$, or 7 : 36.
Or, $\frac{\overset{1}{5}}{2,\overset{2}{8}} \times \frac{\overset{1}{4}}{2,\overset{2}{10}} \times \frac{7}{9} = \frac{7}{36}$,
or 7 : 36. *Ans.*

# SIMPLE PROPORTION.

## *Page 310.*

1. 52 : 13 :: 62 : 4th term.

$$52)\overline{806}(15\tfrac{1}{2}\ \textit{Ans.}$$

PROOF.—$52 \times 15\frac{1}{2} = 13 \times 62$. (Art. 490.)

2. 15 : 90 :: 3d t. : 72.

$$90)\overline{1080}(12, \text{ the 3d t.}$$

3. 60 : 2d t. :: 100 : $33\frac{1}{3}$.

$$100)\overline{2000}(20, \text{ the 2d t.}$$

4. 1st term : 25 :: $\frac{6}{8}$ : $\frac{1}{4}$.
$(25 \times \frac{6}{8}) \div \frac{1}{4} = 75$. *Ans.*

5. 66 ft. (4 r.) : 11 ft. :: 18 m. : 4th term.
Then $198 (18 \times 11) \div 66 =$ 3 m. *Ans.*

6. 24 y. : 3 y. :: 3d term : $12.
Then $288 (24 \times 12) \div 3 =$ $96. *Ans.*

7. 20 g. : 2d term :: $40 : $8.
Then $160 (20 \times 8) \div 40 =$ $32. *Ans.*

8. 1st term : 40 lb. :: 40s. (£2) : 8s.
Then $1600 (40 \times 40) \div 8 =$ 200 lb. *Ans.*

## *Page 312.*

1, 2. Given.

3. 7 bar. : 20 bar. :: 56 : Ans.

$$7)\overline{1120}(\$160$$

Or, 7 b. : 20 b. :: $56 : Ans.
1 : 20 :: 8 : $160 *Ans.*

4. 15 bu. : 75 bu. :: $33 : Ans.
Then $(75 \times 33) \div 15 =$ $165. *Ans.* Or,
15 bu. : 75 bu. :: $33 : A.
1 : 5 :: 33 : $165 *Ans.*

5. 17s. : 150s. :: $51 : Ans.
Then $(150 \times 51) \div 17 =$ $450. *Ans.*
Or, 17s. : 150s. :: $51 : A.
1 : 150 :: 3 : $450 *Ans.*

6. $5\frac{1}{2}$ lb. (5 lb. 8 oz.) : 20 lb. :: $1.65 : Ans.
Then $(1.65 \times 20) \div 5.5 =$ $6 *Ans.*

7. £1, 15s. 6d. = 426d.
65 lb. 8 oz. = 65.5 lb.
6 lb. : 65.5 lb. :: 426 d. : A.
1 : 65.5 :: 71 : 4650.5 d.
4650.5d. = £19, 7s. $6\frac{1}{2}$d. *A.*

*Page 313.*

8. Given.

9. NOTE.—When the slate is used, the *second* or *fractional* form of analysis is generally the most expeditious. The *value* of the fraction, or *ratio*, will be greater or less than 1, according as the *answer* is to be *greater* or less than the *third term*.

45 men are $\frac{45}{11}$ of 11 men; therefore, 45 men will cradle $\frac{45}{11}$ of 33 acres in 1 day. Now,

$\frac{45}{11}$ of $\frac{33}{1} = 135$ acres. *Ans.*

Or, 11 m. : 45 m. :: 33 acres : Ans.
1 : 45 m. :: 3 : 135 acres *Ans.*

10. 75 bar. are $\frac{75}{12}$ of 12 bar.; therefore, I must pay $\frac{75}{12}$ of \$150 for 75 bar. Now,

$\frac{75}{12}$ of $\frac{150}{1} = \$937.50$, *Ans.*

Or, 12 b : 75 b. :: \$150 : Ans.
2 : 75 :: 25 : \$937.50, *Ans.*

11. 12 h. × 60 = 720 min.
720 min. are $\frac{720}{40}$ of 40 min.; therefore, a car will go $\frac{720}{40}$ of 15 miles in 720 min. Now,

$\frac{720}{40}$ of $\frac{15}{1} = 270$ miles, *Ans.*

Or, 40 min. : 720 min. :: 15 m. : Ans.
1 : 18 :: 15 : 270 miles, *Ans.*

12. Since he owes \$3500, he can pay on \$1, but $\frac{1}{3500}$ of his assets. Hence, on \$560 he pays $\frac{560}{3500}$ of \$1800. Now,

$\frac{560}{3500}$ of $\frac{1800}{1} = \$288$, *Ans.*

Or, \$3500 : \$560 :: \$1800 : Ans.
50 : 8 :: 1800 : Ans.
1 : 8 :: 36 : \$288, *Ans.*

*Page 313—Continued.*

13. 235 bar. are $\frac{235}{18}$ of 18 bar.; therefore, 235 bar. will cost $\frac{235}{18}$ of \$63. And

$\frac{235}{2,18}$ of $\frac{63,7}{1} = \frac{1645}{2} = \$822\frac{1}{2}$, *Ans.*

Or, 18 bar. : 235 bar. :: \$63 : Ans.
2 : 235 :: 7 : \$822½, *Ans.*

14. $\frac{1900}{250}$ of $\$17\frac{1}{2} = \$133$. *Ans.*

Or, 250 : 1900 :: $\$17\frac{1}{2}$ $(\frac{35}{2})$ : Ans.

5,250 | 1900, 38, 19
2 | 35, 7
*Ans.* | 7 × 19 = \$133.

15. 7 m. = 12320 yds.

$\frac{12320}{33,11}$ of $\frac{6,2}{1} = \frac{24640}{11} = 2240$ times.

Or, 33 y. : 12320 y. :: 6 t. : Ans.
11 : 12320 :: 2 : 2240 t., *Ans.*

Or, 33 yards ÷ 6 = 5.5 yards, 1 revolution.
12320 yards ÷ 5.5 = 2240 times, *Ans.*

16. $\frac{5000}{1500}$ of $1\frac{1}{2}$ y. = 5 years, *Ans.*

Or, \$1500 : \$5000 :: $1\frac{1}{2}$ $(\frac{3}{2})$ y. : Ans.

3, 1500 | 5000, 10
2 | 3 , 5
*Ans.* | 5 years.

17. ANALYSIS.—It will take 1 man 6 times as long as 6 men; and 6 times 20 h. = 120 h. Again, 15 men are 15 times 1 man; therefore, they will do it in $\frac{1}{15}$ part of 120 h. or 8 hrs. *Ans.*

Or it will take 15 men $\frac{1}{15}$ as long as 1 man, and $\frac{6}{15}$ as long as 6 men. Now, $\frac{6}{15}$ of 20 h. = 8 h. *Ans.*

Or, 15 m. : 6 m. :: 20 h. : Ans.

3, 15 | 6, 2
20, 4
*Ans.* | 4 × 2 = 8 hours.

### *Page 314.*

18. ANALYSIS.—Since to build a fort in 220 days requires 75 men, to build it in 1 day will require 220 times 75 m., or 16500 m.

Again, if 1 day requires 16500 men, 15 days will require $\frac{1}{15}$ of 16500 men, and 16500÷15=1100 men. *Ans.*

Or, since 75 men can build a fort in 220 days, to build the same in 15 days will require

$\frac{220}{15}$ of 75 m.=1100 m., *Ans.*

Or, 15 d. : 220 d. :: 75 m. : Ans.
1 d. : 220 d. :: 5 m. : 1100 m., *Ans.*

19. 100 rods÷5=20 rods to an oz.
20×16=320 r. or 1 m. to a lb.
Now if 1 m. requires 1 lb. of silk, 240000 m. require 240000 lbs. *Ans.*
Or, 100 r. : 76800000 r. :: 5 oz. : Ans.
*Ans.* 38400000 oz. or 240000 lbs.

20. 1 horse will consume it in 12 times 90 d. or 1080 days; and to consume it in 40 days will require as many horses as 40 is contained times in 1080, or 27 h. *Ans.*
Or, 40 d. : 90 d. :: 12 h. : 27 h. *Ans.*

21. Since $\frac{5}{8}$ A. cost \$15, $\frac{1}{8}$ will cost $\frac{1}{5}$ of \$15.
\$15÷5=\$3 for 1 eighth.
Again, $\frac{8}{8}$ will cost 8 times \$3, or \$24.
Now, as 1 A. cost \$24, 25½ A. will cost \$24 × 25½ = \$612. *Ans.*
Or, $\frac{5}{8}$ A. : 25½ A. :: \$15 : \$612. *Ans.*

22. $\frac{1}{8}$ ton will cost $\frac{1}{5}$ of £$\frac{4}{5}$=£$\frac{4}{15}$.,
and $\frac{8}{8}$ or 1 ton £$\frac{4}{15}$ × 8=£$\frac{32}{15}$ per ton.
$\frac{9}{16}$ of £$\frac{32}{15}$=$\frac{6}{5}$ or £1$\frac{1}{5}$, *Ans.*
Or, $\frac{8}{8}$ t. : $\frac{9}{16}$ t. :: £$\frac{4}{5}$ : £1$\frac{1}{5}$, *Ans.*

***Page 314—Continued.***

23. $\$1.75 \div 10.5 = \$0.16\frac{2}{3}$ a pound.
$30\frac{3}{8} \times \$0.16\frac{2}{3} = \$5.06\frac{1}{4}$, *Ans.*
Or, $10\frac{1}{2}$ lb. : $30\frac{3}{8}$ lb. :: $\$1\frac{3}{4}$ : $\$5.06\frac{1}{4}$. *Ans.*

24. $\$35.50 \div 5 = \$7.10$, cost of $\frac{1}{8}$ chest.
$\$7.10 \times 8 = \$56.80$ per chest.
$\$56.80 \times 15\frac{1}{2} = \$880.40$, *Ans.*
Or, $\frac{5}{8}$ c. : $15\frac{1}{2}$ c. :: \$35.50 : \$880.40, *Ans.*

25. $\$126\frac{3}{4} \div 12\frac{1}{2} = \$10.14$ per ton.
$\$10.14 \times 48\frac{3}{8} = \$490.52\frac{1}{4}$, *Ans.*
Or, $12\frac{1}{2}$ t. : $48\frac{3}{8}$ t. :: $\$126\frac{3}{4}$ : $\$490.52\frac{1}{4}$. *Ans.*

26. $\$16250\frac{5}{8} \div 7 = \$2321\frac{29}{56}$, worth of $\frac{1}{12}$ ship.
$\$2321\frac{29}{56} \times 12 = \$27858\frac{3}{14}$, worth of whole.
$\$27858\frac{3}{14} \times \frac{3}{16} = \$5223\frac{93}{224}$, *Ans.*
Or, $\frac{7}{12}$ s. : $\frac{3}{16}$ s. :: $\$16250\frac{5}{8}$ : $\$5223\frac{93}{224}$. *Ans.*

27. $\$0.37\frac{1}{2} \div 3 = \$0.12\frac{1}{2}$ per mile.
$\$0.125 \times 100 = \$12.50$. *Ans.*
Or, 3 m. : 100 m. :: $\$0.37\frac{1}{2}$ : \$12.50. *Ans.*

28. 144 sq. in. $\div 10 = 14.4$ in. *Ans.*
Or, 10 in. : 12 in. :: 12 in. : $14\frac{4}{10}$ in. *Ans.*

29. 15 ft. $\times$ 12 ft. $=$ 180 sq. ft. $=$ 20 sq. yard.
20 sq. y. $\div \frac{3}{4} = 26\frac{2}{3}$ y. carpet. (Art. 287.)
Or, 1 sq. y. : 20 sq. y. :: $\frac{4}{3}$ y. car. : $26\frac{2}{3}$ yards. *Ans.*

30. $68 \times 60 = 4080$ times in 1 hour.
$4080 \times 24 = 97920$ times. *Ans.*
Or, 1 m. : 1440 m. :: 68 t. : 97920 t. *Ans.*

31. 30 days $\times$ 24 $=$ 720 hours.
$2^\circ\ 45' = 165'$.
$165' \div 11 = 15'$ in 1 hour.
$15' \times 720 = 10800'$ or $180^\circ$, *Ans.*
Or, 11 h. : 720 h. :: $165'$ : $10800'$, or $180^\circ$. *Ans.*

32. 7.5 ft. ÷ 10 ft. = .75 ft., shadow of pole 1 ft. high.
60 ft. sh. ÷ .75 ft. sh. = 80 ft. high. *Ans.*
Or, $7\frac{1}{2}$ ft. sh. : 60 ft. sh. :: 10 ft. p. : 80 ft. p. *Ans.*

33. 7 ap. ÷ 3 = $2\frac{1}{3}$ ap., price of 1 orange.
150 ap. ÷ $2\frac{1}{3}$ ap. = $64\frac{2}{7}$ oranges. *Ans.*
Or, 7 ap. : 150 ap. :: 3 or. : $64\frac{2}{7}$ oranges. *Ans.*

34. 3 d. 8 hr. = $3\frac{1}{3}$ d. or $\frac{10}{3}$ d.
1250 m. ÷ $\frac{10}{3}$ = 375 m. per day.
375 m. × 8 = 3000 miles. *Ans.*
Or, $3\frac{1}{3}$ d. : 8 d. :: 1250 m. : 3000 m. *Ans.*

35. 12 men × 11 = 132 men for 1 day.
132 m. ÷ 4 = 33 men. *Ans.*
Or, 4 d. : 11 d. :: 12 m. : 33 m. *Ans.*

36. $\frac{2}{3}$ of 45 ft. = 30 ft. *Ans.*
Or, 3 : 2 :: 15 ft. : Ans.
1 : 2 :: 15 : 30 ft. *Ans.*

## *Page 315.*

37. ANALYSIS.—First find the interest on the Bonds. The income $1350 includes the 6% interest (gold) on the Bonds and $12\frac{1}{2}$% premium on the gold. But the interest is 100% or $\frac{100}{100}$ of itself, and the premium $12\frac{1}{2}$% or $\frac{12\frac{1}{2}}{100}$; and $\frac{100}{100} + \frac{12\frac{1}{2}}{100} = \frac{112\frac{1}{2}}{100}$. Hence, the interest is $\frac{112\frac{1}{2}}{100}$ of $1350. Now $\frac{1}{100}$ of $1350 = $1350 ÷ 112½ or $12, and $\frac{100}{100}$, 100 times $12 or $1200 (gold). Again, if $1 gold yields 60 cents, $1200 gold will yield 1200 times 60 cents or $720, and $720 + $1200 = $1920, the income required.
Or, $112\frac{1}{2}$ : 160 :: $1350 : $1920. *Ans.*

38. George has 20 r. × 10 = 200 r. start.
Henry gains 28 − 20 = 8 r. per min.
If to gain 8 r. requires H. 1 min., 200 r. will require him 200 ÷ 8, or 25 min. *Ans.*
Or, 8 r. : 20 r. :: 10 m. : 25 m. *Ans.*

***Page 315—Continued.***

39. 206 r. 6 ft. = 3405 ft.
18 m. 240 r. = 99000 ft.
3405 ÷ 227 = 15 ft. to 1 rev.
99000 ÷ 15 = 6600 rev. *Ans.*
Or, 3405 ft. : 99000 ft. :: 227 r. : 6600 r. *Ans.*

40. ANALYSIS.—Since 3 lbs. coffee cost \$1.20, 1 lb. costs $\frac{1}{3}$ of \$1.20, or \$0.40, and 10 lbs. cost \$0.40 × 10 = \$4. But by the conditions, 6 lbs. tea are worth \$4; then 1 lb. is worth $\frac{1}{6}$ of \$4 or \$$\frac{2}{3}$, and 60 lbs. are worth \$$\frac{2}{3}$ × 60 = \$40. *Ans.*
Or, 10 lbs. are $\frac{10}{3}$ of 3 lbs., and $\frac{10}{3}$ of \$1.20 = \$4.
Again, 60 lbs. are $\frac{60}{6}$ of 6 lbs.,
and $\frac{60}{6}$ of \$4 = $\frac{60,10}{6}$ × 4 = \$40. *Ans.*
Or, 6 lb. t. : 60 lb. t. :: \$4 : \$40. *Ans.*

41. $\frac{1}{4}$ c. + $\frac{1}{6}$ c. = $\frac{5}{12}$ c. both chop per hour. Hence, to chop 1 cord will require them as many hours as $\frac{5}{12}$ are contained times in $\frac{12}{12}$. And
$\frac{12}{12} \div \frac{5}{12} = 2\frac{2}{5}$ hrs. *Ans.*
Or, $\frac{5}{12} : \frac{12}{12} :: 1$ hr. : $2\frac{2}{5}$ hrs. *Ans.*

42. All empty $\frac{1}{8} + \frac{1}{10} + \frac{1}{12} = \frac{37}{120}$ of reservoir in 1 hour, or $\frac{1}{120}$ r. in $\frac{1}{37}$ h. and $\frac{120}{120}$ r. in $\frac{1}{37}$ h. × 120 = $\frac{120}{37}$ or $3\frac{9}{37}$ hrs. *Ans.*
Or, $\frac{37}{120}$ res. : 1 res. :: 1 h. : $3\frac{9}{37}$ hrs. *Ans.*
Or the least common multiple of 8, 10, and 12 is 120.
Then, 8 h. : 120 h. :: 1 r. : 15 r.
10 h. : 120 h. :: 1 r. : 12 r.
12 h. : 120 h. :: 1 r. : 10 r.
In 120 h. all empty 37 res.
37 r. : 1 r. :: 120 h. : $3\frac{9}{37}$ hrs. *Ans.*

43. Since it lasted the man 30 days, he drank $\frac{18}{30}$ of it in 18 d., and the wife $\frac{12}{30}$ of it in 18 d. Now if $\frac{12}{30}$ of it lasts her 18 d., $\frac{1}{30}$ of it will last her $\frac{1}{12}$ of 18 d., or $\frac{18}{12}$ d. = $1\frac{1}{2}$ d., and $\frac{30}{30}$ will last 30 times $1\frac{1}{2}$ d. or 45 d. *Ans.*
Or, $\frac{12}{30} : \frac{30}{30} ::$ 18 d. : 45 d. *Ans.*

***Page 315—Continued.***

44. Since the hound runs 20 rods while the fox runs 18 rods, in every 20 r. the hound gains 2 rods. If to gain 2 r. requires 20 r., 1 r. gain will require 10 r.; and 100 r. will require $10 \times 100 = 1000$ r. *Ans.*
Or, 2 r. gain : 100 r. gain :: 20 r. run : 1000 r. *Ans.*

45. Since 45 g. runs in and 33 g. runs out in 1 hour, the cistern fills at the rate of $45 - 33 = 12$ g. per hour. Hence, if to fill 12 g. requires 1 hr., to fill 3600 g. will require as many hours as 12 is contained times in $3600 = 300$ h. *Ans.*
Or, 12 g. : 3600 g. :: 1 hr. : 300 hr. *Ans.*

46. From Jan. 1st to May 21st is 140 d. Therefore, he should have $\frac{140}{365}$ or $\frac{28}{73}$ of $\$500 = \$191.78+$. *Ans.*
Or, 365 d. : 140 d. :: \$500 : \$191.78. *Ans.*

47. From 12 o'clock Saturday night to Tuesday noon is 60 h., and the gain is 3 m. If 60 h. gain 3 m., 1 h. gains $\frac{3}{60}$ m. or 3 sec. From Saturday night to 9 o'clock Sunday it is $(24 \times 7) + 9 = 177$ h. Now if it gains 3 sec. in 1 h., in 177 h. it gains 531 sec. = 8 m. 51 sec. *Ans.* 8 m. 51 sec. before 9 o'clock.
Or, 60 h. : 177 h. :: 3 m. gain : 8 m. 51 sec. *Ans.*

48. At 2 for a ct., eggs were $\frac{1}{2}$ ct. each, or 50 ct. per 100
At 3 " " $\frac{1}{3}$ ct. " $33\frac{1}{3}$ ct. per 100
Hence, she paid $83\frac{1}{3}$ ct. for 200
Selling at 5 for 2 cts. is $\frac{2}{5}$ ct. each, or 80 cts. for 200 eggs. Hence, the cost $83\frac{1}{3}$ cts. $- 80$ cts. $= 3\frac{1}{3}$ cts. loss. *A.*
Or, 2 eggs : 100 eggs :: 1 ct. : 50 cts.
3 " : 100 " :: 1 ct. : $33\frac{1}{3}$ cts.
Then 200 eggs cost \$0.83⅓
And 5 : 200 :: 2 cts. : \$0.80 received.
She lost \$0.03⅓ *Ans.*

49. 1 d. : 6 d. :: 6 m. : 36 m., excess of one.
336 m. $-$ 36 m. $=$ 300 m. Now (Art. 97) 300 m. $\div 2 =$ 150 m., less dis., and 150 m. $+$ 36 m. $=$ 186 m., gr. dis.

# COMPOUND PROPORTION.

*Page 317.*

3. 7 m : 6 m. } :: 2 d. : Ans.
28 A. : 42 A. }

$3,\frac{\cancel{42}\times 6\times \cancel{2}}{\cancel{14},\ \cancel{28}\times 7}=\frac{\cancel{18}}{7}$, or $2\frac{4}{7}$ d. *Ans.*

Or, since 6 m. will mow 28 A. in 2 d., they will mow 14 A. in 1 day. If 6 m. mow 14 A., 1 m. mows $2\frac{1}{3}$ A. and 7 men 7 times $2\frac{1}{3}$ A., or $16\frac{1}{3}$ A. in 1 d. Then if $16\frac{1}{3}$ A. require 7 m. 1 d., 42 A. will require them as many days as $16\frac{1}{3}$ is contained times in 42, or $2\frac{4}{7}$ d. *Ans.*

4. 32 A. : 24 A. } :: 8 h. : Ans.
4 d. : 6 d. }

NOTE.—When a perpendicular line is placed between the *first* and *second* terms, the *third* term should be placed under the second terms, with the sign of proportion (::) before it, to show its origin and its relation to the answer.

| | |
|---|---|
| 4, 32 | 24, 6, 3 |
| 2, 4 | 6, 3 |
| | :: 8 |
| *Ans.* | $3\times 3=9$ horses. |

Or, if plowing 32 A. in 6 d. require 8 horses, to do it in 1 day would require $6\times 8=48$ horses, and to do it in 4 days, $\frac{1}{4}$ of 48 or 12 horses. Again, if the plowing of 32 A. in 4 d. require 12 horses, to plow 24 A. in the same time would require $\frac{2}{3}\frac{4}{2}$ or $\frac{3}{4}$ of $12=9$ horses. *Ans.*

5. 12 p. : 8 p. } :: 15 weeks : Ans.
$300 : $1000. }

| | |
|---|---|
| 3, 12 | 8, 2 |
| 20, $300 | $1000, 50 |
| | :: 15 |
| 3 | $100=33\frac{1}{3}$ w. *Ans.* |

Or, $300 ÷ 15 = $20 a week for 8 persons.
$20 ÷ 8 = $2.50 apiece per week.
$1000 ÷ $2.50 = 400 weeks for 1 person.
400 ÷ 12 = $33\frac{1}{3}$ weeks. *Ans.*

*Page 318.*

6. 7 b. : 28 b. } :: $23.75 :
15 lb. : 20 lb. }

| | |
|---|---|
| 7 b. | 28 b., 4 |
| 3, 15 lb. | 20 lb., 4 |
| | :: $23.75 |
| 3 | $380 = $126.66⅔ |

Or, 15 lbs. × 7 = 105 lbs. in 7 boxes.

$23.75 ÷ 105 = .22 13/21 p. lb.

$.22 13/21 × 20 = $4.52 8/21 p. b.

$4.52 8/21 × 28 = $126.66⅔.

7.

| | |
|---|---|
| 10 m. | 15 m. |
| 20, $300 | $1100, 50 |
| | :: $20, 2 |
| *Ans.* | 50 × 2 = $100. *A.* |

Or, $20 int. on $300 for 10 m. = $2 for 1 m.

On $100, it is ⅓ of $2 = $⅔ a month.

For $1000 it is $⅔ × 10 = $6⅔ per month.

$6⅔ × 15 = $100. *Ans.*

8.

| | |
|---|---|
| 6 d. | 15 d. |
| 10 h. | 8 h. |
| | :: 180 m., 3. |
| *Ans.* | 15 × 8 × 3 = 360 m. |

Or, 180 m. ÷ 6 d. = 30 m. in 1 d. of 10 h., or 3 m. per hr. 3 × 8 = 24 m. per d. of 8 h. each.

24 × 15 = 360 miles. *Ans.*

9.

| | |
|---|---|
| 4 ft. | 6 ft. |
| 40 ft. | 125 ft. |
| | :: $160, $1 |
| *Ans.* | $1 × 125 × 6 = $750 |

Or, 40 ft. × 4 ft. = 160 sq. ft., given walk.

125 ft. × 4 ft. = 720 sq. ft., required walk.

Now if 160 sq. ft. cost $160, 1 sq. ft. will cost $1, and 750 sq. ft. $750. *Ans.*

10.

| | |
|---|---|
| ⅞ y. | ¾ y. |
| 100 m. | 1500 m., 15 |
| | :: 800 y. |
| *Ans.* | 800 × 15 × ¾ = 9000; 900 ÷ ⅞ = 1028 4/7 y. |

Or, since 800 yds. are required of ¾ or 6/8 yd. wide, it would take of ⅛ yd. wide 6 times 800 or 4800 yds. to supply 100 men. But at ⅞ yd. wide, it requires ⅐ of 4800 or 685⅐ yds. for 100 men.

Again, if 100 men require 685⅐ yds., 1500 men will require 685⅐ × 15 = 10285⅐ yds. *Ans.*

### *Page 318—Continued.*

11. NOTE.—Should the learner find any difficulty in this and similar examples, in arranging the terms in pairs, it will be advisable for him to find the solid contents of each wall, before stating the question. Thus,

$50 \times 8 \times 3 = 1200$ cu. ft.
$150 \times 10 \times 4 = 6000$ cu. ft.

| | |
|---|---|
| 100 m. | 75 m. |
| 50 ft. | 150 ft. |
| 2, 8 ft. | 10 ft. |
| 3 ft. | 4 ft. |
| | :: 10 d. |
| 2 | $75 = 37\frac{1}{2}$ days. *Ans.* |

Or, if in 10 d. 75 m. build 1200 cu. ft., in 1 d. they build $\frac{1}{10}$ of 1200, or 120 cu. ft. And if 75 m. build 120 cu. ft. in 1 d., 1 man would build $\frac{1}{75}$ of 120, or $1\frac{3}{5}$ cu. ft. per day. Again, 100 m. would build $1\frac{3}{5} \times 100$, or 160 cu. ft. per day. And 6000 cu. ft. would require them $6000 \div 160$, or $37\frac{1}{2}$ days. *Ans.*

12.

| | |
|---|---|
| 7 t. | 40 t., 4 |
| 11, 110 m. | 500 m. |
| | :: $56, 8 |
| 11 | $16000 = $1454\frac{6}{11}$. *Ans.* |

Or, if the freight on 7 tons is $56 for 110 m., it is $\frac{1}{7}$ of $56 or $8 per ton; and if $8 for 110 m., it is $\frac{8}{110}$ or $\frac{4}{55}$ for 1 m. Now if freight is $\frac{4}{55}$ per ton, 40 tons will cost $\frac{4}{55} \times 40 = \$2\frac{10}{11}$ per mile, and for 500 m. the cost will be $2\frac{10}{11} \times 500 = \$1454\frac{6}{11}$. *Ans.*

13.

| | |
|---|---|
| 3 p. | 50 p. |
| 6, 42 y. | 35 y., 5. |
| $\frac{5}{8}$ y. | $1\frac{1}{8}$ |
| | :: 30 lb., 5 |
| 1, 875 | 1406.25 = 750 lbs. *Ans.* |

Or, since 30 lbs. cotton make 3 pieces 42 y. long and

***Page 318—Continued.***

$\frac{1}{8}$ y. wide or $78\frac{3}{4}$ sq. y., 1 lb. will make $78\frac{3}{4} \div 30 = 2.625$ sq. y. Now, 35 y. $\times 1\frac{1}{8}$ y. $= 39\frac{3}{8}$ sq. y. in 1 piece. And $39\frac{3}{8}$ sq. y. $\times 50 = 1968\frac{3}{4}$ sq. y. in 50 p. Since to make 2.625 sq. y. requires 1 lb. cotton, 1968.75 sq. y. will require $1968.75 \div 2.625 = 750$ lbs. *Ans.*

14. ~~100~~, ~~$600~~ | $2500, 25
2, ~~10~~ m. | 5 m.
~~7~~% | 6%
 | :: $35, 5
2 | 125 = $62.50. *Ans.*

Or, if the int. is $35 for 10 m., it is $\frac{1}{10}$ of $35 or $3.50 for 1 m. If at 7% the int. is $3.50 per m., at 1% it is $\frac{1}{7}$ of $3.50 or $.50, and at 6% it is 6 times $.50 or $3.00. Now if $600 yield $3 int. per m. at 6%, $100 will yield $\frac{1}{6}$ of $3.00 or $.50, and in 5 m. the int. is $.50 $\times 5 =$ $2.50. Again, if $100, at 6%, yield $2.50 int. in 5 m., $2500 will yield 25 times $2.50, or $62.50. *Ans.*

15. 9 m. | 58 m., 5
3, ~~30~~ d. | ~~90~~ d.
~~10~~ h. | 8 h.
 | :: 18 s., 6
 | 240 sofas. *Ans.*

Or, 18 sofas are made by 9 m. in 30 d. of 10 h., or in 300 hrs. If 9 m. work 300 hrs. to make 18 sofas, 1 m. must work 9 times 300, or 2700 hours. And if 18 sofas require 1 m. 2700 hrs., 1 sofa would be made in $\frac{1}{18}$ of 2700, or 150 hrs.

Now, if 1 m. can make 1 sofa in 150 hrs., 50 m. can make 50 sofas in the same time, and in 720 hrs. (90 d. of 8 h. each) they can make $\frac{720}{150}$, or $4\frac{4}{5}$ times $50 = 240$ sofas. *Ans.*

16.

| | |
|---|---|
| 100 sq. in. | 32 sq. in. |
| 5, 50 ft. | 15 ft., 3 |
| 5, 40 ft. | 8 ft. |
| | :: 9000 b., 90, 9 |
| *Ans.* | 864 tiles. |

Or, the bricks required $= 8 \times 4 \times 9000 = 288000$ sq. in.
50 ft. $\times$ 40 ft. $= 2000$ sq. ft., in the court-yard.
10 in. sq. $= 100$ sq. in. in each tile.
Since the bricks required to cover the court-yard contain 288000 sq. in., and 1 tile contains 100 sq. in., it will take as many tiles to cover it as 100 is contained times in 288000, or 2880 tiles. And since the yard contains 2000 sq. ft., $\frac{1}{10}$ of 2880, or 144 tiles, would cover 100 sq. ft. The hall contains 75 ft. $\times$ 8 ft. $=$ 600 sq. ft. Since 144 tiles are required to 100 sq. ft., 600 sq. ft. will require $144 \times 6 = 864$ tiles. *Ans.*

17.

| | |
|---|---|
| 15 t. | 300 t., 30, 2 |
| 8 d. | 36 d., 3 |
| 12 qt. | 15 qt., 2 |
| 18 lb. | 6 lb. |
| | :: 10 b. |
| *Ans.* | $2 \times 3 \times 2 \times 6 \times 10 = 720$ boxes. |

## PARTITIVE PROPORTION.

***Page 319.***

3. Since the 1st had 2 sheep, the 2d 3, and the 3d 5, all had $2+3+5$, or 10 sheep. Hence,
The 1st had $\frac{2}{10}$ of 200 or 40 sheep.
The 2d " $\frac{3}{10}$ of 200 or 60 "
The 3d " $\frac{5}{10}$ of 200 or 100 "
Or, 10 : 2 :: 200 : 40 s.
10 : 3 :: 200 : 60 s. } *Ans.*
10 : 5 :: 200 : 100 s.
Or, $200 \div (2+3+5) = 20$. Now $20 \times 2 = 40$ sheep; $20 \times 3 = 60$ sheep; and $20 \times 5 = 100$ sheep.

4. 12.5 : 3 :: 250 : 60 bushels.
12.5 : 4 :: 250 : 80 "
12.5 : 5.5 :: 250 : 110 "
} *Ans.*

Or, $250 \div (3+4+5\frac{1}{2}) = 12.5 = 20$.

$20 \times 3 = 60$ bushels of oats.
$20 \times 4 = 80$ bushels of peas.
$20 \times 5\frac{1}{2} = 110$ bushels of corn.
} *Ans.*

***Page 320.***

5. 14 : 2 :: 497 acres : 71 acres.
14 : 3 :: 497 acres : $106\frac{1}{2}$ acres.
14 : 4 :: 497 acres : 142 acres.
14 : 5 :: 497 acres : $177\frac{1}{2}$ acres.
} *Ans.*

Or, $497 \div (2+3+4+5) = 14 = 35\frac{1}{2}$.

$35\frac{1}{2} \times 2 = 71$ acres.
$35\frac{1}{2} \times 3 = 106\frac{1}{2}$ acres.
$35\frac{1}{2} \times 4 = 142$ acres.
$35\frac{1}{2} \times 5 = 177\frac{1}{2}$ acres.
} *Ans.*

# PARTNERSHIP.

***Page 321.***

2. The capital = \$1200 + \$1500 = \$2700. Then,
\$2700 (cap.) : \$1200 (A's) :: \$500 (loss) : $\$222\frac{2}{9}$ (A's loss).
\$2700 " : \$1500 (B's) :: \$500 " : $\$277\frac{7}{9}$ (B's loss).

Or, the loss $\$500 \div \$2700 = 18\frac{4}{27}\%$ of the capital. Then,
$\$1200 \times .18\frac{4}{27} = \$222.22\frac{2}{9}$, A's share of the loss.
$\$1500 \times .18\frac{4}{27} = \$277.77\frac{7}{9}$, B's " " "
} *Ans.*

3. The cap. = \$3000 + \$4500 = \$7500. Rent = \$850 a year. Hence,
\$7500 (cap.) : \$3000 (A's) :: \$850 (rent) : \$340, A's sh.
\$7500 " : \$4500 (B's) :: \$850 " : \$510, B's sh.
Or, the rent $\$850 \div \$7500 = 11\frac{1}{3}\%$ of the capital. Then,
$\$3000 \times 11\frac{1}{3}\% = \$340$, A's; and $\$4500 \times .11\frac{1}{3} = \$510$, B's.

*Page 321—Continued.*

4. The capital = $15000 + $12000 + $10000 = $37000. Hence,
$37000 (cap.) : $15000 (A's) :: $12500 (gain) : $5067$\frac{2}{3}\frac{1}{7}$, A's gain.
$37000 (cap.) : $12000 (B's) :: $12500 (gain) : $4054$\frac{4}{3}\frac{2}{7}$, B's gain.
$37000 (cap.) : $10000 (C's) :: $12500 (gain) : $3378$\frac{1}{3}\frac{4}{7}$, C's gain.

Or, the gain $12500 ÷ $37000 = .33$\frac{2}{3}\frac{2}{7}$ of the capital. Hence,

$15000 × 33$\frac{2}{3}\frac{2}{7}$% = $5067.56$\frac{2}{3}$, A's gain.
$12000 × 33$\frac{2}{3}\frac{2}{7}$% = $4054.05$\frac{1}{3}$, B's gain.
$10000 × 33$\frac{2}{3}\frac{2}{7}$% = $3378.37$\frac{1}{3}$, C's gain.

5. 9 : 2 :: $15300 : $3400, 1st.
9 : 3 :: $15300 : $5100, 2d.
9 : 4 :: $15300 : $6800, 3d.

Or, 2+3+4=9 pints;
$15300÷9=$1700; and
$1700 × 2=$3400, the first;
$1700 × 3=$5100, the second;
$1700 × 4=$6800, the third.

6. 80 s.+120 s.+200 s.=400 sheep.
400 s. : 80 s. :: $320 : $64, A's share.
400 s. : 120 s. :: $320 : $96, B's share.
400 s. : 200 s. :: $320 : $160, C's share.

Or, 320÷400=80%. Then,
$80 × .80=$64, A's share;
120 × .80=$96, B's share;
200 × .80=$160, C's share.

### *Problem II. Page 322.*

8. $500 for 9 m. = $4500 for 1 m., A's capital.
$700 for 12 m. = $8400 for 1 m., B's "
$400 for 15 m. = $6000 for 1 m., C's "
The whole cap. = $18900 for 1 m. Then,
$18900 : $4500 :: $600 (loss) : $142.85$\frac{5}{7}$, A's share.
$18900 : $8400 :: $600 " : $266.66$\frac{2}{3}$, B's "
$18900 : $6000 :: $600 " : $190.47$\frac{13}{21}$, C's "
Or, $600 ÷ $18900 = 03$\frac{11}{63}$%. Then,
$4500 × .03$\frac{11}{63}$ = $142.85$\frac{5}{7}$, A's share.
$8400 × .03$\frac{11}{63}$ = $266.66$\frac{2}{3}$, B's "
$6000 × .03$\frac{11}{63}$ = $190.47$\frac{13}{21}$, C's "

9. 20 horses for 12 w. = 240 h. for 1 w.
25 " " 10 w. = 250 h. " 1 w.
Whole number = 490 h. " 1 w. Then,
490 h. : 240 h. :: $50 : $24.48$\frac{8}{49}$.
490 h. : 250 h. :: $50 : $25.51$\frac{1}{49}$.
Or, $50 ÷ 490 = 10$\frac{10}{49}$%. Then,
240 × .10$\frac{10}{49}$ = $24.48$\frac{8}{49}$, one.
250 × .10$\frac{10}{49}$ = $25.51$\frac{1}{49}$, other. *Ans.*

### *Page 323.*

10. Jan. 1st, $1000 × 12 m. = $12000 for 1 m., A's capital.
Mar. 1st, $1200 × 10 m. = $12000 " B's "
July 1st, $1500 × 6 m. = $9000 " C's "
Sept. 1st, $2000 × 4 m. = $8000 " D's "
The whole capital = $41000 for 1 m. Then,
$41000 : $12000 :: $1450 (gain) : $424$\frac{16}{41}$, A's share.
$41000 : $12000 :: $1450 " : $424$\frac{16}{41}$, B's "
$41000 : $9000 :: $1450 " : $318$\frac{12}{41}$, C's "
$41000 : $8000 :: $1450 " : $282$\frac{28}{41}$, D's "
Or, $1450 ÷ $41000 = 3$\frac{22}{41}$%. And,
$12000 × .03$\frac{22}{41}$ = $424.39$\frac{1}{41}$, A's share;
$12000 × .03$\frac{22}{41}$ = $424.39$\frac{1}{41}$, B's; $9000 × .03$\frac{22}{41}$ = $318.29$\frac{11}{41}$, C's; $8000 × .03$\frac{22}{41}$ = $282.92$\frac{28}{41}$, D's.

*Page 323—Continued.*

11. $3000+$4500+$6000=$13500, Amount of insurance.
$13500 : $3000 :: $6750 (loss) : $1500, Howard.
$13500 : $4500 :: $6750 " : $2250, Continental.
$13500 : $6000 :: $6750 " : $3000, American.
Or, $6750÷13500=50%. Then,
$3000 × .50 = $1500, share of H.'s; $4500 × .50 = $2250, C.'s; $6000 × .50=$3000, A.'s.

12. 150 bbl. × 40= 6000 bbl. for 1 m., A's part.
170 bbl. × 60=10200 bbl. " B's "
210 bbl. × 75=15750 bbl. " C's "
250 bbl. × 100=25000 bbl. " D's "
Am't transp'd=56950 bbl. for 1 m. Then,
56950 bbl. : 6000 bbl. :: $2500 : $263.38$\frac{1018}{11139}$, A's sh.
56950 bbl. : 10200 bbl. :: $2500 : $447.76$\frac{136}{11139}$, B's sh.
56950 bbl. : 15750 bbl. :: $2500 : $691.39$\frac{679}{11139}$, C's sh.
56950 bbl. : 25000 bbl. :: $2500 : $1097.45$\frac{445}{11139}$, D's sh.
Or, $2500÷56950=4$\frac{444}{11139}$%. Then,
6000 × .04$\frac{444}{11139}$= $263.38$\frac{1018}{11139}$, A's share.
10200 × .04$\frac{444}{11139}$= $447.76$\frac{136}{11139}$, B's "
15750 × .04$\frac{444}{11139}$= $691.39$\frac{679}{11139}$, C's "
25000 × .04$\frac{444}{11139}$=$1097.45$\frac{445}{11139}$, D's "

13. $8000 × 4= $32000 for 1 m.
$10000 × 6= $60000 " 1 m., or $92000, A's capital.
$16000 × 3= $48000 " 1 m.
$8000 × 5= $40000 " 1 m., or $88000, B's capital.
$13500 × 7= $94500 " 1 m., C's cap.
Whole cap.=$274500 " 1 m. Then,
$274500 : $92000 :: $12000 : $4021$\frac{157}{183}$, A's share.
$274500 : $88000 :: $12000 : $3846$\frac{182}{183}$, B's "
$274500 : $94500 :: $12000 : $4131$\frac{27}{183}$, C's "
Or, $12000÷$274500=4$\frac{68}{183}$%. And
$92000 × .04$\frac{68}{183}$=$4021.85$\frac{145}{183}$, A's share.
$88000 × .04$\frac{68}{183}$=$3846.99$\frac{83}{183}$, B's "
$94500 × .04$\frac{68}{183}$=$4131.14$\frac{138}{183}$, C's "

# BANKRUPTCY.

*Page 324.*

1. Given.

2. $6300+$4500+$3200=$14000, liabilities.
Assets $5250—$1500 expenses=$3750, net proceeds.
Then,
$14000 : $6300 (A's claim) :: $3750 : $1687.50, A's sh.
$14000 : $4500 (B's claim) :: $3750 : $1205.35$\frac{5}{7}$, B's "
$14000 : $3200 (D's claim) :: $3750 : $857.14$\frac{2}{7}$, D's "

3. $48400=liabilities. $13200—$1100=$12100, net pr.
$48400 : $8240 :: $12100 : $2060, D received. *Ans.*
Or, $12100÷$48400=25%; and $8240×.25=$2060.

# ALLIGATION.

*Page 325.*

2. 1 lb., @ 12 cts.
1 lb., " 15 "
1 lb., " 20 "
3 lb.)47 cts.
$15\frac{2}{3}$ cts. a lb. *Ans.*

3. 30 bu. × $1.25 = $37.50
25 bu. × .60 = 15.00
10 bu. = .95 = 9.50
65 bu. )$62.00
*Ans.* $0.95$\frac{5}{13}$ a bu.

4. 5 gal. × .80 = $4.00
107 " × 00 = 0.00
63 " × .20 = 12.60
175 gal. )$16.60
$0.09$\frac{17}{35}$ p. g.

5. 12 oz. × 22 car. = 264
8 oz. × 20 " = 160
7 oz. × 18 " = 126
27 oz. )550 car.
1 oz. is = 20$\frac{10}{27}$ car.

6. 160 qts. (40 gal.) × 4 cts. = $6.40
240 " (60 gal.) × 2 " = 4.80
48 " (12 gal.) × 0 " = 0.00
448 qts. cost $11.20
448 × .06 = $26.88, Amount received.
$26.88—$11.20=$15.68, profit. *Ans.*

## CANFIELD'S METHOD.*

*Page 326.*

7. Taking the given prices in pairs, one *less*, the other *greater* than the mean price, we find $\frac{1}{6}$ lb. of the 1st is required to *gain* and $\frac{1}{2}$ lb. of the 4th to *lose* 1s. or a *unit* of the mean price. Place these results in Col. 1 opposite the corresponding prices compared. In like manner, we find 1 lb. of the 2d is required to *gain*, and $\frac{1}{2}$ lb. of the 3d to *lose* a unit of the mean price. Place these results in Col. 2 opposite the corresponding prices. Finally, reduce the numbers in Cols. 1 and 2 to a common denominator separately, placing the results in Col. 3; or, we may multiply each of them by 6, the least common denominator, and place the results in Col. 4. The proportional parts in Cols. 3 and 4 answer the conditions. Hence, the

| | Col. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 9s. | 3s. | $\frac{1}{6}$ | | 1 | 1 |
| | 8s. | | 1 | 2 | 6 |
| | 11s. | | $\frac{1}{2}$ | 1 | 3 |
| | 12s. | $\frac{1}{3}$ | | 2 | 2 |

RULE.—I. *Write the prices of the ingredients in a column in their order, with the mean price on the left.*

II.—*Taking them in pairs, one less and the other greater than the mean price, find how much is required of one article to* GAIN *and of the other to* LOSE *a unit of the mean price, and set the results in Col.* 1 *opposite to the corresponding prices compared. Compare the other couplets in like manner, setting the results of each in a separate column.*

III.—*Finally, reduce the numbers in each column to a common denominator separately: the results will be the proportional parts required.*

*Or, multiply the numbers in all the columns by the least common multiple of their denominators, and the results will be the proportional parts required.*

* This method is due to the late Prof. A. B. Canfield, A.M., of Cazenovia Seminary, N. Y.

*Problem I. Page 327.*

8.

| | | | |
|---|---|---|---|
| $2 | $1.60 | 10+25=35 bu., 1st. | *Ans.* |
| | 2.10 | 40 =40 bu., 2d. | |
| | 2.25 | 40 =40 bu., 3d. | |

9.

1ST OPERATION.

| | | |
|---|---|---|
| 20 | 15 | 2 parts. |
| | 18 | 1 " |
| | 21 | 2 " |
| | 22 | 5 " |

2D OPERATION.

| | | |
|---|---|---|
| 20 | 15 | 1 part. |
| | 18 | 2 " |
| | 21 | 5 " |
| | 22 | 2 " |

3D OPERATION.

| | | |
|---|---|---|
| 20 | 15 | 1+2=3 parts. |
| | 18 | 2=2 " |
| | 21 | =5 " |
| | 22 | 2+5=7 " |

4th. 1 part at 15 car. fine.
3 " " 18 " "
7 " " 21 " "
2 " " 22 " "

5th. 3 parts at 15 car. fine.
3 " " 18 " "
7 " " 21 " "
7 " " 22 " "

10. There are but 3 ingredients in this example; we therefore compare the one less than the mean price with each of the others; the sum of the numbers standing opposite $= \frac{2}{6}$. The least common denominator of all the fractions is 42; hence, the parts are 14 lbs. at 32 cts., 21 lbs. at 40 cts., and 6 lbs. at 45 cts.

| | Col. | 1. | 2. | 3. | |
|---|---|---|---|---|---|
| 38 | 32 | $\frac{1}{6}+\frac{1}{6}$ | $\frac{2}{6}$ | 14 | lbs. |
| | 40 | $\frac{1}{2}$ | $\frac{1}{2}$ | 21 | " |
| | 45 | $\frac{1}{7}$ | $\frac{1}{7}$ | 6 | " |

11.

| | Col. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 20 | $\frac{1}{12}$ | | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| | 27 | | $\frac{1}{5}$ | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 |
| | 35 | | $\frac{1}{3}$ | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| | 40 | $\frac{1}{8}$ | | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 |

NOTES.—1. Since he made a profit of 10 cts. a lb. by selling the mixture at 42 cts., the mean *cost* of it was 42−10=32 cts.

2.—Reducing columns 1 and 2 to a common denominator, we have column 3. Multiplying column 3 by 2, 3, 4, etc., *gives columns* 4, 5, 6, etc.

**Again, if the proportional parts of one couplet are multiplied or divided by one number, and those of the other couplet by any other number, the results will answer the conditions.**

| 2d. | 3d. | 4th. |
|---|---|---|
| 11 lbs. at 20 cts. | 11 lbs. at 20 cts. | 8 lbs. at 20 cts. |
| 11 " " 27 " | 3 " " 27 " | 11 " " 27 " |
| 17 " " 35 " | 17 " " 35 " | 5 " " 35 " |
| 17 " " 40 " | 12 " " 40 " | 17 " " 40 " |

## *Problem II. Page 328.*

13. ANALYSIS.—10 bu. oats at 30 cts.=$3, and 20 bu. rye at 60 cts. =$12. But 10 bu.+20 bu.=30 bu., and $3+$12=$15. Now $15+30=50 cts.; therefore, the mean value of 30 bu., the sum of the two ingredients given, is 50 cts. The question now is, how much of each of the other two kinds must be mixed with 30 bu. at 50 cts. to make a mixture worth 55 cts. a bu.? The ratio of the *sum* of the given ingredients, 30 bu., to its proportional part, 25 bu., is 30 to 25, or $\frac{6}{5}$. Therefore, multiplying each part found by this ratio, we have 30 bu. of barley at 40 cts. and 24 bu. of corn at 80 cts. to be mixed with 30 bu. at 50 cts., or with 10 bu. at 30 cts. and 20 bu. at 60 cts.

OPERATION.

$$55 \begin{cases} 40 & 25 \times \frac{6}{5} = 30 \\ 50 & 25 \times \frac{6}{5} = 30 \\ 80 & 15 + 5 = 20 \times \frac{6}{5} = 24 \end{cases}$$

14. The proportional parts are 5 lbs. each at 40 cts., 45 cts., and 50 cts. respectively, and 45 lbs. at 65 cents. But this last quantity is limited to 30 lbs. The ratio of 30 to 45=$\frac{2}{3}$. Multiplying each of the other results, we have $3\frac{1}{3}$ lbs., at 40, 45, and 50 cts. *Ans.*

15. In finding the proportional parts, we set down the *value* of the water as 0. Then the parts are 1 qt. water, 1 qt. at 4 cts. and 6 qts. at 6 cts. But the ratio of the given quantity of water to the part found is 50 to 1 or 50. Multiplying as before, we have 50 qts. at 4 cts. and 300 qts. at 6 cents. *Ans.*

### *Problem III.—Page 329.*

17. The parts are 2 lbs. at 6 cts., 2 lbs. at 8 cts., and 6 lbs. at 12 cts. = 10 lbs. But the mixture contained 100 lbs. The ratio is $\frac{100}{10} = 10$. 2 lbs. × 10 = 20 lbs. at 6 cts.; 2 lbs. × 10 = 20 lbs. at 8 cts.; and 6 lbs. × 10 = 60 lbs. at 12 cts. *Ans.*

18. 1st. The parts are 6 lbs. at 28 cts., 2 lbs. at 30 cts., 6 lbs. at 38 cts., and 8 lbs. at 42 cts. = 22 lbs. The mixture has 200 lbs. The ratio is $\frac{200}{22} = 9\frac{1}{11}$. Then $6 \times 9\frac{1}{11} = 54\frac{6}{11}$ lbs. at 28 cts., $2 \times 9\frac{1}{11} = 18\frac{2}{11}$ lbs. at 30 cts., $6 \times 9\frac{1}{11} = 54\frac{6}{11}$ lbs. at 38 cts., $8 \times 9\frac{1}{11} = 72\frac{8}{11}$ lbs. at 42 cts. *Ans.*

2d. 2 lbs. at 28 cts., or mult. by the ratio $9\frac{1}{11}$, $18\frac{2}{11}$ lbs.
6 " " 30 " " " " " $54\frac{6}{11}$ "
8 " " 38 " " " " " $72\frac{8}{11}$ "
6 " " 42 " " " " " $54\frac{6}{11}$ "

3d. 8 lbs. at 28 cts., or mult. by the ratio $5\frac{5}{9}$, $44\frac{4}{9}$ lbs.
6 " " 30 " " " " " $33\frac{3}{9}$ "
8 " " 38 " " " " " $44\frac{4}{9}$ "
14 " " 42 " " " " " $77\frac{7}{9}$ "

4th. 2 lbs. at 28 cts., or mult. by the ratio $6\frac{2}{3}$, $13\frac{1}{3}$ lbs.
8 " " 30 " " " " " $53\frac{1}{3}$ "
14 " " 38 " " " " " $93\frac{1}{3}$ "
6 " " 42 " " " " " 40

5th. 8 lbs. at 28 cts., or mult. by the ratio $4\frac{6}{11}$, $36\frac{4}{11}$ lbs.
8 " " 30 " " " " " $36\frac{4}{11}$ "
14 " " 38 " " " " " $63\frac{7}{11}$ "
14 " " 42 " " " " " $63\frac{7}{11}$, "

6th. 8 lbs. at 28 cts., or mult. by the ratio $6\frac{2}{3}$, $53\frac{1}{3}$ lbs.
2 " " 30 " " " " " $13\frac{1}{3}$ "
14 " " 38 " " " " " $93\frac{1}{3}$ "
6 " " 42 " " " " " 40 "

7th. 6 lbs. at 28 cts., or mult. by the ratio $5\frac{15}{17}$, $35\frac{5}{17}$ lbs.
8 " " 30 " " " " " " $47\frac{1}{17}$ "
6 " " 38 " " " " " " $35\frac{5}{17}$ "
14 " " 42 " " " " " " $82\frac{6}{17}$ "

19. The parts are 8 gal. each at 40, 45, and 50 cts., and 21 gals. at 60 cts. = 45 gals. The mixture has 300 gals. The ratio therefore is $\frac{300}{45} = 6\frac{2}{3}$.
Then, $8 \times 6\frac{2}{3} = 53\frac{1}{3}$ gals. at 40 cts.
$8 \times 6\frac{2}{3} = 53\frac{1}{3}$ " " 45 "
$8 \times 6\frac{2}{3} = 53\frac{1}{3}$ " " 50 "
$21 \times 6\frac{2}{3} = 140$ " " 60 "

# INVOLUTION.

## *Page 331.*

1, 2. Given.
3. $85^4$.
4. $348^5$.
5. $340^7$.
6. $561^8$.
7. Given.

| | INTEGRAL. | DECIMAL. |
|---|---|---|
| 8. | 25. | 9. .25 |
| | 36 | .36 |
| | 49 | .49 |
| | 64 | .64 |
| | 81 | .81 |
| | 100 | .0001 |
| | 400 | .0004 |
| | 900 | .0009 |
| | 1600 | .0016 |
| | 2500 | .0025 |
| | 3600 | .0036 |
| | 4900 | .0049 |
| | 6400 | .0064 |
| | 8100 | .0081 |

10. $5^3 = 5 \times 5 \times 5 = 125$.
11. $2^6 = 64$.
12. $132^3 = 2299968$.
13. $4^5 = 1024$.
14. $8^4 = 4096$.
15. $25^3 = 15625$.
16. $2.03^3 = 8.365427$.
17. $4.0003^3 =$ 64.014401080027.
18. $400.05^3 =$ 64024003.000125.
19. $\frac{3}{5}^4 = \frac{81}{625}$.
20. $\frac{7}{8}^3 = \frac{343}{512}$.
21. $2\frac{1}{4}^4 = \frac{6561}{256}$.

## *Page 332.*

22. Given.
23. $2^3 \times 2^2 = 2^5$.

24. $3^4 \times 3^3 = 3^7$.
25. $4^3 \times 4^4 = 4^7$.
26. $5^4 \times 5^2 = 5^6$.

***Page 333.***

1, 2. Given.

3. $23 = 20 + 3$
$23 = 20 + 3$
$69, \quad 400 + 60$
$46 \quad 60 + 9$
$529 = 400 + 120 + 9$

# SQUARE ROOT.

***Page 338.***

1–4. Given.

5. $\dot{1}\dot{8}\dot{2}\dot{3}\dot{2}\dot{9}(427$ *Ans.*
16
82) 223
164
847) 5929
5929

6. $\dot{5}\dot{1}\dot{6}\dot{9}\dot{6}\dot{1}(719$ *Ans.*
49
141) 269
141
1429)12861
12861

7. $\dot{5}\dot{9}\dot{5}\dot{9}\dot{8}\dot{4}(772$ *Ans.*
49
147)1059
1029
1542)3084
3084

8. $\dot{3}.\dot{5}\dot{8}0(1.892+$
1
28)258
224
369)3400
3321
3782)7900
7564
336, rem.

NOTE.—By adding other periods of ciphers, the operation may be continued at pleasure.

9. $.\dot{4}0\dot{9}\dot{6}(.64$ *Ans.*
36
124)496
496

10. $.\dot{1}2\dot{0}4\dot{0}9(.347$ *Ans.*
9
64)304
256
687)4809
4809

*Page 338—Continued.*

11. .1681(.41 *Ans.*
16
81)81
81

12. .7250(.8514+ *Ans.*
64
165)850
825
1701)2500
1701
17024)79900
68096
11804

13. .126100(.355+ *Ans.*
9
65)361
325
705)3600
3525
75

14. 2.6752(1.635+ *Ans.*
1
26)167
156
323)1152
969
3265)18300
16325
1975

15. 4826.75(69.47+
36
129)1226
1161
1384)6575
5536
13887)103900
97209
6691

16. 452.6340(21.275
4
41)52
41
422)1163
844
4247)31940
29729
42545)221100
212725
8375

17. 5.00(2.236+ *A*
4
42)100
84
443)1600
1329
4466)27100
26796
304

*Page 338—Continued.*

18. $\dot{7}.0\dot{0}(2.64+$ *Ans.*

4
46)300
276
524)2400
2096
304

19. $\dot{8}.0\dot{0}(2.828+$ *Ans.*

4
48)400
384
562)1600
1124
5648)47600
45184
2416

20. $1\dot{0}.0\dot{0})3.16+$ *Ans.*

9
61)100
61
626)3900
3756
144

21. $1\dot{1}.0\dot{0}(3.316+$ *Ans.*

9
63)200
189
661)1100
661
6626)43900
39756
4144

22. $1\dot{2}.0\dot{0})3.46+$ *Ans.*

9
64)300
256
686)4400
4116
284

23. $\dot{1}9.5\dot{3}\dot{6}\dot{4}(4.42$ *Ans.*

16
84)353
336
882)1764
1764

24. $3\dot{2}\dot{8}\dot{3}.2\dot{9}(57.3$ *Ans.*

25
107)783
749
1143)3429
3429

25. $\dot{8}7.\dot{6}5(9.36+$ *Ans.*

81
183)665
549
1866)11600
11196
404

26. $\dot{1}2345\dot{6}7\dot{8}9)11111.11+$

1
21)023
21
221)245
221
2221)2467
2221
22221)24689
22221
222221)246800
222221
2222221)2457900
2222221
235679

27. $\dot{6}1\dot{7}2\dot{3}0\dot{2}0.\dot{9}6(7856.4$

49
148)1272
1184
1565)8830
7825
15706)100520
94236
157124)628496
628496

28. $\dot{9}\dot{7}\dot{5}4.\dot{6}0\dot{4}2\dot{3}7\dot{1}6(98.7654$

81
188)1654
1504
1967)15060
13769
19746)129142
118476
197525)1066637
987625
1975304)7901216
7901216

*Page 339.*

29–31. Given.

32. $\sqrt{\frac{121}{256}}=\frac{11}{16}$. *Ans.*

33. $\frac{5}{9}=.5555+$.

$\dot{.}\dot{5}\dot{5}\dot{5}\dot{5}(.745+$ *An*

49
144)655
576
1485)7955
7425
530

34. $\frac{9}{12}=\frac{3}{4}$, or .75,

$\sqrt{.75}=.866+$. *An*

35. $6\frac{2}{3}=6.4$.

$\dot{6}.\dot{4}0(2.529+$ *Ans.*

4
45)240
225
502)1500
1004
5049)49600
45441
4159

36. $13\frac{1}{3}=13.2$.

$\dot{1}\dot{3}.\dot{2}0(3.63+$ *Ans.*

9
66)420
396
723)2400
2169
231

37. $17\frac{3}{8} = 17.375$.

17.3750(4.1683+ *Ans.*
16
81)137
81
826)5650
4956
8328)69400
66624
83363)277600
250089
27511

38. $\sqrt{\frac{256}{625}} = \frac{16}{25}$. *Ans.*

39. $\sqrt{\frac{576}{900}} = \frac{24}{30}$. *Ans.*

40. $\frac{3417}{4687} = .7301927+$.

.73019270(.8545+ *Ans.*
64
165)901
825
1704)7692
6816
17085)87670
85425
2245

41. $1\frac{3}{80} = 1.0375$.

1.0375(1.018+ *Ans.*
1
201)0375
201
2028)17400
16224
1176

42. $27\frac{9}{16} = \frac{441}{16}$.

$\sqrt{\frac{441}{16}} = \frac{21}{4}$. *Ans.*

43. $51\frac{21}{25} = \frac{1296}{25}$.

$\sqrt{\frac{1296}{25}} = \frac{36}{5}$. *Ans.*

### *Page 339.*

1. Given.

2. 1102 A. × 160 = 176320 sq. rods.
176320 + 80 = 176400 sq. rods.

176400(420 rods. *Ans.*
16
82)164
164

### *Page 340.*

3. 122 A. × 160 + 30 = 19550 sq. r.

19550(139.82 + one side.
1 4 sides.
23)95 559.28 r. *Ans.*
69
269)2650
2421
2788)22900
22304
27962)59600
55924
3676

4. $\dot{1}4\dot{1}6\dot{1}$(119 trees. *Ans.*

1

21)41

21

229)2061

2061

5. $\dot{5}6\dot{6}4\dot{4}$(238 men. *Ans.*

4

43)166

129

468)3744

3744

***Page 341.***

6. Given.

7. NOTE.—It is advisable for the learner to draw a diagram representing the parts given and the part required in this and the next six examples.

$135^2 = 18225$

$81^2 = 6561$

$\dot{1}1\dot{6}\dot{6}\dot{4}$(108 yds.

1

208)1664

1664

8. $50^2 = 2500$

$40^2 = 1600$

$\dot{9}0\dot{0}$(30 rods. *Ans.*

9

00

9. $250^2 = 62500$

$360^2 = 129600$

$\dot{1}9\dot{2}1\dot{0}\dot{0}$(438.29+

16

83)321

249

868)7200

6944

8762)25600

17524

87649)807600

788841

18759

10. $144^2 = 20736$

$100^2 = 10000$

$\dot{1}0\dot{7}\dot{3}\dot{6}$)103.61-

1

203)0736

609

2066)12700

12396

20721)30400

20721

9679

11. $40^2 = 1600$

$40^2 = 1600$

$\dot{3}\dot{2}\dot{0}\dot{0}$)56.56+ft.

25

106)700

636

1125)6400

5625

11306)77500

67836

9664

12. $35^2 = 1225$
$21^2 = 441$

$1666(40.81+$ ft.
16

$808)6600$
$6464$

$8161)13600$
$8161$

$5439$

35 ft. stump + 40.81 + ft. top = 75.81 + ft. *Ans.*

***Page 342.***

13, 14. Given.

15. $7\text{ in.}^2 : 2\text{ in}^2 :: 42\text{ m.}$
$49 : 4 :: 42 : 3\frac{3}{7}\text{ min.}$

16. Given.

17. $36 \times 4 = 144$,
$\sqrt{144} = 12$. *Ans.*

18. $36 \times 81 = 2916$,
$\sqrt{2916} = 54$. *Ans.*

19. $56 \times 72 = 4032$,
$\sqrt{4032} = 63.49+$ *Ans.*

20. $.49 \times 6.25 = 3.0625$.
$\sqrt{3.0625} = 1.75$. *Ans.*

21. $\frac{16}{49} \times \frac{4}{36} = \frac{64}{1764}$,
$\sqrt{\frac{64}{1764}} = \frac{8}{42}$. *Ans.*

22. $\frac{81}{100} \times \frac{64}{144} = \frac{5184}{14400}$,
$\sqrt{\frac{5184}{14400}} = \frac{72}{120}$. *Ans.*

## FORMATION OF CUBES.

***Page 344.***

1. Given.

2. $\sqrt[3]{340566}$ has 2 figs. *Ans.*

3. $\sqrt[3]{1467}$ has 2 figs. *Ans.*

4. $\sqrt[3]{576.453}$ has 2 figs. *Ans.*

5. $\sqrt[3]{5.732100}$ has 3 figs. *Ans.*

6. $\sqrt[3]{32.756100}$ has 3 figs. *A.*

7. $\sqrt[3]{.456785}$ has 2 figs. *Ans.*

# CUBE ROOT.

*Page 348.*

3. 614125(85 *Ans.*

| | |
|---|---|
| | 512 |
| 19200 | 102125 |
| 1200 | |
| 25 | |
| 20425 | 102125 |

4. 84.604(4.38+ *Ans.*

| | |
|---|---|
| | 64 |
| 4800 | 20604 |
| 360 | |
| 9 | |
| 5169 | 15507 |
| 554700 | 5097000 |
| 10320 | |
| 64 | |
| 565084 | 4520672 |
| | 576328 |

5. 373248(72 *Ans.*

| | |
|---|---|
| | 343 |
| 14700 | 30248 |
| 420 | |
| 4 | |
| 15124 | 30248 |

6. 3.000(1.44+ *Ans.*

| | |
|---|---|
| | 1 |
| 300 | 2000 |
| 120 | |
| 16 | |
| 436 | 1744 |
| 58800 | 256000 |
| × 560 | |
| 16 | |
| 59376 | 237504 |
| | 18496 |

7. 21024576(2.76 *A*

| | |
|---|---|
| | 8 |
| 1200 | 13024 |
| 420 | |
| 49 | |
| 1669 | 11683 |
| 218700 | 1341576 |
| 4860 | |
| 36 | |
| 223596 | 1341576 |

8. 17.000(2.57+ *A*

| | |
|---|---|
| | 8 |
| 1200 | 9000 |
| 300 | |
| 25 | |
| 1525 | 7625 |
| 187500 | 1375000 |
| 5250 | |
| 49 | |
| 192799 | 1349593 |
| | 25407 |

9. 70591994726 4(8

| | |
|---|---|
| | 512 |
| 19200 | 193919 |
| 2160 | |
| 81 | |
| 21441 | 192969 |
| 237630000 | 950947264 |
| 106800 | |
| 16 | |
| 237736816 | 950947264 |

*Page 348—Continued.*

10. .25339579 9(.632 +

| | |
|---|---|
| 216 | |
| 10800 | 37395 |
| 540 | |
| 9 | |
| 11349 | 34047 |
| 1190700 | 3348799 |
| 3780 | |
| 4 | |
| 1194484 | 2388968 |
| | 959831 |

11. 628568(85.6 + yds.

| | |
|---|---|
| 512 | |
| 19200 | 116568 |
| 1200 | |
| 25 | |
| 20425 | 102125 |
| 2167500 | 14443000 |
| 15300 | |
| 36 | |
| 2182836 | 13097016 |
| | 1345984 |

12. $40 \times 15 \times 6 = 3600$ cu. ft.

$\sqrt[3]{3600}$(15.3 + ft. *Ans.*

| | |
|---|---|
| 1 | |
| 300 | 2600 |
| 150 | |
| 25 | |
| 475 | 2375 |
| 67500 | 225000 |
| 1350 | |
| 9 | 206577 |
| 68859 | 18423 |

13. 2150.4 × 1000 = 2150400 cu. in.

2150400(129.07 + in.

| | |
|---|---|
| 1 | |
| 300 | 1150 |
| 60 | |
| 4 | |
| 364 | 728 |
| 43200 | 422400 |
| 3240 | |
| 81 | |
| 46521 | 418689 |
| 4992300000 | 3711000000 |
| 270900 | |
| 49 | |
| 4995009 49 | 3496506643 |
| | 214493357 |

14, 15. Given.

16. $\frac{729}{1750} = .41657\,1428 +$.

.41657 1428(.746 +

| | |
|---|---|
| 343 | |
| 14700 | 73571 |
| 840 | |
| 16 | |
| 15556 | 62224 |
| 1642800 | 11347428 |
| 13320 | |
| 36 | 9936936 |
| 1656156 | 1410492 |

17. $\sqrt[3]{\frac{12167}{15625}} = \frac{23}{25}$. *Ans.*

18. $\sqrt[3]{\frac{729}{1728}} = \frac{9}{12}$. *Ans.*

19. $81\frac{5}{8}=81{,}625$.

$$\begin{array}{r|l} & 81.625(4.3+ \\ & 64 \\ \hline 4800 & 17625 \\ 360 & \\ 9 & 15507 \\ \hline 5169 & 2118 \end{array}$$ *Ans.*

### *Page 349.*

1. Given.

2. Cu. ft. Cu. ft. ft.
$\sqrt[3]{74088} : \sqrt[3]{17576} :: 84 :$
$42 \text{ ft.} : 26 \text{ ft.} :: 84 : 52 \text{ ft.}$

$$\begin{array}{r} 26 \\ \hline 42)2184(52 \text{ ft.} \end{array}$$

3. Given.

4. $8^3=512$; $512\times 8=4096$ cu. ft., contents.
$\sqrt[3]{4096}=16$ ft. *Ans.*

5. $60^3 : 20^3 :: 12500$ cu. ft. :
$60^3=216000$; $20^3=8000$.

$$\begin{array}{r} 216000)100000000 \\ \hline \end{array}$$
*Ans.* 462.96 + cu. ft.

6. $15^3$ ft. : $12^3$ ft. :: 6 T. :
$12^3=1728$

$$\begin{array}{r} 6 \\ \hline 3375)10368 \end{array}$$
*Ans.* 3.072 tons.

# ARITHMETICAL PROGRESSION.

### *Page 351.*

1. $7-1=6$ No. terms, less 1.
$2\times 6=12+3=15$. *Ans.*

3. $3\times 9=27$.
$35-27=8$. *Ans.*

5. NOTE.—The principal is the first term of an arithmetical series; the amount, the last term; the interest for 1 year, the common difference; and the number of years plus 1, the number of terms.

For, since the principal is the first term, the second term is the principal plus the interest for 1 year; hence, the number of terms must be 1 greater than the number of years.

$\$150\times .07=\$10.50$, c. dif.
$\$10.50\times 20=\$210$, and
$\$210+\$150$ (1st term) $=$
$\$360$. *Ans.*

7. $21-1=20$, dif. extremes.
$20\div 2=10$.
$10+1=11$ children. *Ans.*

### *Page 352.*

9. $20-2=18$, dif. extremes.
$18\div 6=3$ yrs. *Ans.*

11. $(12+1)\div 2=6\frac{1}{2}$.
$6\frac{1}{2}\times 12=78$ strokes. *Ans.*

# GEOMETRICAL PROGRESSION.

*Page 353.*

1. Since there are 6 terms, the ratio 2 must be raised to the 5th (6 − 1) power. Now $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$. Hence, the last term $= 3 \times 32 = 96$. *Ans.*

2. The ratio is 2; the number of terms 10, and $10 - 1 = 9$; therefore the ratio 2 must be raised to the 9th power, and $2^9 = 512$. Hence,
The last term $= 2$ cts. $\times 512 = \$10.24$. *Ans.*

3. The amount of \$1 for 1 year, at 6% = \$1.06. Therefore, \$1500 is the first term, 1.06 the ratio, and 5 the number of terms. (Art. 567, N. 3.)
$(1.06^5) = 1.3382255776$; \$1500 × 1.3382255776 = \$2007.3383664, at 5%. *Ans.*
$(1.07)^6 = 1.500730351849$; \$2000 × 1.500730351849 = \$3001.460703698, at 6%. *Ans.*

*Page 354.*

4. Assuming the series to be ascending, the first term is 2, and the last 162, and 162 × 3 (the ratio) = 486. Now, $486 - 2 = 484$, and $484 \div 2 = 242$, the sum of the series. *Ans.*

5. $972 \times 3 = 2916$; $2916 - 4 = 2912$; $2912 \div 2 = 1456$.

6. Here are *two steps:* First, to find the last term; second, to find the sum of the terms. (Arts. 567, 568.)
The ratio is 2; the number of terms 12, and $12 - 1 = 11$.
Now $2^{11} = 2048$, and $1 \times \$2048 = \$2048$, the last term.
Again, \$2048 × 2 = \$4096. But \$4096 − 1 = \$4095; and \$4095 ÷ 1 = \$4095, the sum paid. *Ans.*

7. The ratio being $\frac{1}{2}$, the difference between the ratio and 1 is $\frac{1}{2}$.
*Then the first term* $\frac{2}{3} \div \frac{1}{2} = \frac{4}{3} \times \frac{2}{1} = \frac{8}{3} = 1\frac{2}{3}$. *Ans.*

# MENSURATION.

### *Page 356.*

1. Given.

2. $75 \times 48 = 3600$ sq. yds.

3. $120^2 = 14400$ sq. r. *Ans.*

4. $80$ A. $\times 160 = 12800$ sq. r.
$12800 \div 160 = 80$ r. *Ans.*

### *Page 357.*

5, 6. Given.

7. $50$ yds. $\times 20 = 1000$ sq. yds.
$1000 \div 30\frac{1}{4} = 33\frac{7}{11}$ sq. r.
$33\frac{7}{11} \times \$2.75 = \$90.90\frac{10}{11}$.

8. Given.

9. $3.14159 \times 65 =$
$204.20335$ r. *Ans.*

10. $150$ ft. $\div 3.14159 =$
$47.746\frac{164386}{314159}$ ft.

11. $100$ r. $\div 3.14159 =$
$31.831\frac{4871}{314159}$ r. *Ans.*

12. $75$ ft. $\times 3.14159 =$
$235.61925$ ft. cir.
$235.61925 \div 2 =$
$117.809625 = \frac{1}{2}$ cir.
$117.809625 \times 37.5 =$
$4417.8609375$ sq. ft. *Ans.*

13. $200$ r. $\div 3.14159 =$
$63.662 +$ r. diameter.
$63.662 \div 2 = 31.831 = \frac{1}{2}$ di.
$31.831 \times 100 = 3183.1$ sq. r.

### *Page 358.*

15. $18 \times 3.14159 = 56.54862$ ft. cir.
$\frac{1}{2}$ cir. $= 28.27431 \times 9 =$
$254.46879$ sq. ft. $=$ area of base.
$254.46879 \times 15 =$
$3817.03185$ cu. ft. *Ans.*

16. $5^2 = 25$; $3^2 = 9$.
$25 + 9 = 34$ sq. ft., area of 2 ends.
$25 \times 9 = 225$, product of areas.
$\sqrt{225} = 15$, and
$15 + 34 = 49$.
$\frac{2}{3}$ of $32$ ft. $= 10\frac{2}{3}$.
$49 \times 10\frac{2}{3} = 522\frac{2}{3}$ cu. ft.

17. Given.

### *Page 359.*

18. $18$ ft. $\times 42$ ft. $= 756$ sq. ft.

19. Given.

20. $2162 \times 3.14159 =$
$6792.11758$ cir.
$6792.11758 \times 2162 =$
$14684558.20796$ sq. m.

21. Given.

22. $7912 \div 6 = 1318\frac{2}{3} = \frac{1}{6}$ di.
$197663000 \times 1318\frac{2}{3} =$
$260651609333\frac{1}{3}$ cu. m.

## MISCELLANEOUS EXAMPLES.

*Page 360.*

1. $650 \div 3 = \$216\frac{2}{3} = \frac{1}{3}$ pr.
$\$216\frac{2}{3} \times 5 = \$1083\frac{1}{3}$. *Ans.*

2. $\$75 \div 5 = \$15$, one-eighth.
$\$15 \times 8 = \$120$, cost.
$\$120 - \$75 = \$45$, loss.

3. $2126 - 742 = 1384$.
$1384 \div 2 = 692$, the less.
$692 + 742 = 1434$, the gr.

4. The greatest common divisor of 154, 242, and 374 is 22. 22 ft. *Ans.*

5. ANALYSIS. — Each ship will return to New York, the starting point, in every number of days that is a multiple of the days in its trip; hence, all will meet at New York in every number of days that is a common multiple of their respective trips. Therefore, the time of their first meeting must be the least common multiple of their respective trips.

The least common mult. of 10, 12, and 16 is 240.
*Ans.* 240 days.

6. 7 h. : 14 h. :: $33\frac{1}{4}$ m. : 1st, or $66\frac{1}{2}$ m.
5 : 14 :: $27\frac{1}{2}$ : 2d, or 77 m. *Ans.* $143\frac{1}{2}$ m.
Or, if in 7 h. one goes $33\frac{1}{4}$ m., in 14 h. he will go twice $33\frac{1}{4}$ m., or $66\frac{1}{2}$ m. Again, since the other goes $27\frac{1}{2}$ m. in 5 h., in 1 h. he will go $\frac{1}{5}$ of $27\frac{1}{2}$ m. or 5.5 m., and in 14 h. he will go 14 times 5.5 m. or 77 m. Now $66\frac{1}{2}$ m. + 77 m. = $143\frac{1}{2}$ m. *Ans.*

7. A has 1 part as often as B has 2 parts and C 7 parts. Now $1 + 2 + 7 = 10$.

10)$200
$20 A's part.
$\$20 \times 2 = \$40$, B's "
$\$20 \times 7 = \$140$, C's "

8. $11.25 \div 5 = 2.25$ bu. per A.
$11.25 \times 35\frac{3}{8} = 79.59\frac{3}{8}$ bu.

9. $4\frac{1}{2} \times 3\frac{4}{5} = \$17.10$, cost ap.
$\$17.10 \div \$3.25 = 5.26\frac{2}{13}$ c.

10. $\frac{7}{7} - \frac{3}{7} = \frac{4}{7} = \$20$. Now, if $\$20 = \frac{4}{7}$ of his earnings, $\frac{1}{7} = \$20 \div 4$, or \$5, and $\frac{7}{7} = \$35$. But $\$35 \div 11\frac{2}{3} = \$3$ per day. *Ans*

11. Since 1000 cost \$31.25, the cost of 1 = \$0.03$\frac{1}{8}$.
$5250 \times .03\frac{1}{8} = \$164.06\frac{1}{4}$, cost of all.
$5250 \times .04 = \$210$, sell. pr.
$\$210 - \$164.06\frac{1}{4} = \$45.93\frac{3}{4}$, profit. *Ans.*

12. 15)7° 50′ 4″

31 m. $20\frac{4}{15}$ sec., difference of time.
12 o'cl. 0 m. 0 sec., Baltimore.
plus 31 m. $20\frac{4}{15}$ sec.
12 o'cl. 31 m. $20\frac{4}{15}$ sec., Cincinnati. *Ans.*

13. 1000 doz. = 12000; and 12 cts. a doz. = 1 ct. each; hence, the cost is \$120. He sold 20 for 25 cts. or $1\frac{1}{4}$ cts. ea. Now $12000 \times 1\frac{1}{4}$ ct. = \$150, selling price.
Subtracting \$120, cost.
*Ans.* \$30, profit.

14. 15)21° 13′ 0″ difference lon.
1 h. 24 m. 52 sec., " time.
9 o'cl. 0 m. 0 sec., Bangor.
minus 1 h. 24 m. 52 sec.
7 o'cl. 35 m. 8 sec. A. M., New Orleans.

15. $(15 \times 10) \div 12 = 12\frac{1}{2}$ ft., the contents of 1 board.
$12\frac{1}{2}$ ft. $\times 12 = 150$ ft., " " " 12 "
$150 \times \$0.16 = \$24.00$. *Ans.*

***Page 361.***

16. Since $\frac{2}{3}$ Farmer's = $\frac{1}{12}$ Neighbor's, $\frac{1}{3}$ F's = $\frac{1}{2}$ of $\frac{1}{12}$ or $\frac{1}{24}$ N's; and $\frac{3}{3}$ F's = $\frac{3}{24}$ N's = $\frac{1}{8}$ N's. But $\frac{1}{8} + \frac{8}{8} = \frac{9}{8}$, the number of both. Now if $\frac{9}{8}$ of the number = 27 cows, $\frac{1}{8}$ is $\frac{1}{9}$ of 27 or 3 cows, the farmer's, and $\frac{8}{8}$ = 8 times 3 or 24 cows, the neighbor's.

17. $14 \times 20 = 280$ sq. in.
$25 \times 21 = 525 \times 2 = 1050$ sq. ft.
1050 sq. ft. $\times 144 =$ 151200 sq. in.
$151200 \div 280 = 540$ sh.

18. By the conditions, $\frac{3}{4}$ of A's part + \$6 = $\frac{3}{5}$ of B's part. Then $\frac{1}{5}$ of B's = $\frac{1}{4}$ of A's + \$2, and $\frac{5}{5} = \frac{5}{4}$ of A's + \$10. Then, $\frac{5}{4} + \$10 + \frac{4}{4} = \frac{9}{4} + 10 =$ \$100.
$\frac{9}{4} =$ \$90. $\frac{1}{4} =$ \$10. And $\frac{4}{4} =$ \$40, A's part.
$\frac{5}{4} + \$10 =$ \$60, B's part.

19. $21 \times 2 + 14 \times 2 = 70$ rods.
70 r. = 13860 in.
$13860 \div 7\,(4+3) = 1980$ pickets. *Ans.*

20. $883.20 − $768 = $115.20
$115.20 ÷ 768 = .15, or 15%. *Ans.*

21. 75 A. × 160 = 12000 sq. r.
12000 ÷ 80 = 150 rods.

22. 27 C. = 3456 cu. ft.
36 × 12 = 432 sq. ft.
3456 ÷ 432 = 8 ft. *Ans.*

23. 425 lb. × 60 = 25500 lb.
25500 × .22½ = $5737.50
Int. 9 m., 7% = $301.22
Am't rec'd = $6038.72

24. 3 h. 1 m. 39 sec.
15
45° 24′ 45″, dif. lon.

25. 104 × 31¼ = 3250 sq. ft.
3250 ÷ 9 = 361⅑ sq. ft.
361⅑ × $22½ = $8125.

26. $\frac{17}{20} = \frac{34}{40}$ t. If $\frac{34}{40}$ t. cost £$\frac{7}{2}$, $\frac{1}{40}$ costs £$\frac{1}{34}$ of $\frac{7}{2}$ = £$\frac{7}{68}$, and $\frac{37}{40}$ will cost £$\frac{7}{68} \times 37$ = £$3\frac{5}{8}$. *Ans.*
Or, $\frac{34}{30} : \frac{37}{40} :: £\frac{7}{2} :$ Ans. $(\frac{7}{2} \times 37) \div 34$ = £$3\frac{5}{8}$ = £3, 16s. $2\frac{2}{17}$d. *Ans.*

27. NOTE.—Since the rate of insurance is 2%, on a policy of $100 the owner would receive but $98; for he pays $2 insurance. Now, if .98 requires $1 to be insured, $16500 will require as many dollars as .98 is contained times in $16500.
$1.00 − .02 = $0.98.
$16500 ÷ .98 =
$16836.734+. *Ans.*

28. 20 × 8 = 160 sq. r. =
43560 sq. ft.
43560 ÷ 3 = 14520 men.

29. $4284¼ × 4 = $17137, cost
$17137 × .16 = $2741.92, profit.
17137 + 2741.92 =
$19878.92. *Ans.*

30. 16 A. = 696960 sq. ft.
8 ft. apart = 64 sq. ft. to 1 vine.
696960 ÷ 64 = 10890 v's.
10890 × 6¼ cts. =
$680.625. *Ans.*

31. If a shadow of 7 ft. requires a 10 ft. pole, a shadow of 1 ft. requires $\frac{10}{7} = 1\frac{3}{7}$ ft., and a shadow of 54 ft. requires $1\frac{3}{7} \times 54 = 77\frac{1}{7}$ ft. *Ans.*
Or, 7 ft. s. : 54 ft. s. ::
10 ft. p. : 77⅐ ft. pole.

### *Page 362.*

32. $2500 ÷ .20 = $12500.

33. $1.25 × 1.20 = $1.50, s.pr.
100% − 6% = 94% or .94.
$1.50 ÷ .94 = $1.59, m. pr.

***Page 362—Continued.***

34. The average time of the two is 6 mo. The bank discount of $1500 for 6 m. 3 d. = $53.375. Then $1500 — $53.375 = $1446.625, proceeds. *Ans.*

35. $60^2 - 36^2 = 2304$. $\sqrt{2304} = 48$ ft. *Ans.* (Art. 543.)

36. We first find the hypothenuse of the triangle formed from diagonal corners of the floor. Then consider this length the *base* of another triangle reaching to the diagonal corner of the ceiling. Thus,
$48^2 + 36^2 = 2304 + 1296 = 3600$.
$\sqrt{3600} = 60$ ft., hyp. of 1st and base of 2d triangle.
Then, $60^2 + 11^2 = 3721$. $\sqrt{3721} = 61$ ft. *Ans.*

37. For every dollar raised the city receives 94 cts. ($1 — 6%); hence, $212624.70 ÷ .94 = $226196.489+. *Ans.*

38. The selling price, 62½ cts., includes both the cost $\frac{100}{100}$ + the profit, $\frac{20}{100} = \frac{120}{100}$.
Then, $625 ÷ 1.20 = 52\frac{1}{12}$ cts., the cost.
Hence, $.75 — $.52\frac{1}{12} = $.22\frac{11}{12}$, percentage.
$.22\frac{11}{12} ÷ .52\frac{1}{12} = .44$, or 44% profit, if sold at 75 cts.

39. £534.5 × $4.878 = $2607.291. *Ans.*

40. 2 + 3 + 5 = 10 parts.
Now $\frac{1}{10}$ of $27000 = $2700.
$2700 × 2 = $5400, share of first.
$2700 × 3 = $8100, " " second.
$2700 × 5 = $13500, " " third.

41. $135.50 ÷ .05 = $2710, amount of sales.
$2710 — $135.5 = $2574.50. *Ans.*

NOTE.—Since his commission ($135.50) was .05 on $1, he received for the goods as many dollars as .05 is contained times in $135.50, or $2710. Then this sum, minus the commission, will be the net proceeds.

*Page 362—Continued.*

42. 5 men × 4 = 20 men, A furnished for 1 d.
6 men × 5 = 30 men, B " " "
7 men × 6 = 42 men, C " " "
Equivalent to 92 men, 1 day.

$\frac{20}{92}$ of \$230 = \$50, A's share.
$\frac{30}{92}$ " " = \$75, B's "
$\frac{42}{92}$ " " = \$105, C's "

43. Since B was \$50 in debt in 5 years, he ran behind \$10 a year. Spending \$40 a year more than A, who saved $\frac{1}{4}$, it follows that \$40 was \$10 more than $\frac{1}{4}$ of their salary; hence, $\frac{1}{4}$ salary = \$40 − \$10, or \$30. Now if $\frac{1}{4}$ = \$30, $\frac{4}{4}$ = 4 times 30, or \$120, salary of each.
$\frac{3}{4}$ of \$120 = \$90, the sum A spent.
\$90 + \$40 = \$130, the sum B spent.

Or, since A saved $\frac{1}{4}$ of his salary, he spent $\frac{3}{4}$; and since B run in debt \$50 in 5 years, he spent \$10 a year more than his income. Hence, $\frac{3}{4}$ of his salary + \$30 = $\frac{4}{4}$, or the whole salary. Now if $\frac{3}{4}$ + \$30 = $\frac{4}{4}$, $\frac{1}{4}$ = \$30; and $\frac{4}{4}$ = 4 times \$30, or \$120, salary of each. Hence, A spent \$90, B \$130.

44. $24^2 : 6^2 ::$ 80 h. : Ans.
576 sq. in. : 36 sq. in. :: 80 hrs. : 5 hrs. *Ans.*

45. First, find the last term. (Art. 567.)
The ratio is 3, and
$3^{11} = 177147$ = last term.
Second, find the sum of all the terms. (Art. 568.)
177147 × 3 = 531441, product last term by ratio.
531441 − 1 = 531440, difference.
531440 ÷ 2 = \$265720. *Ans.*

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